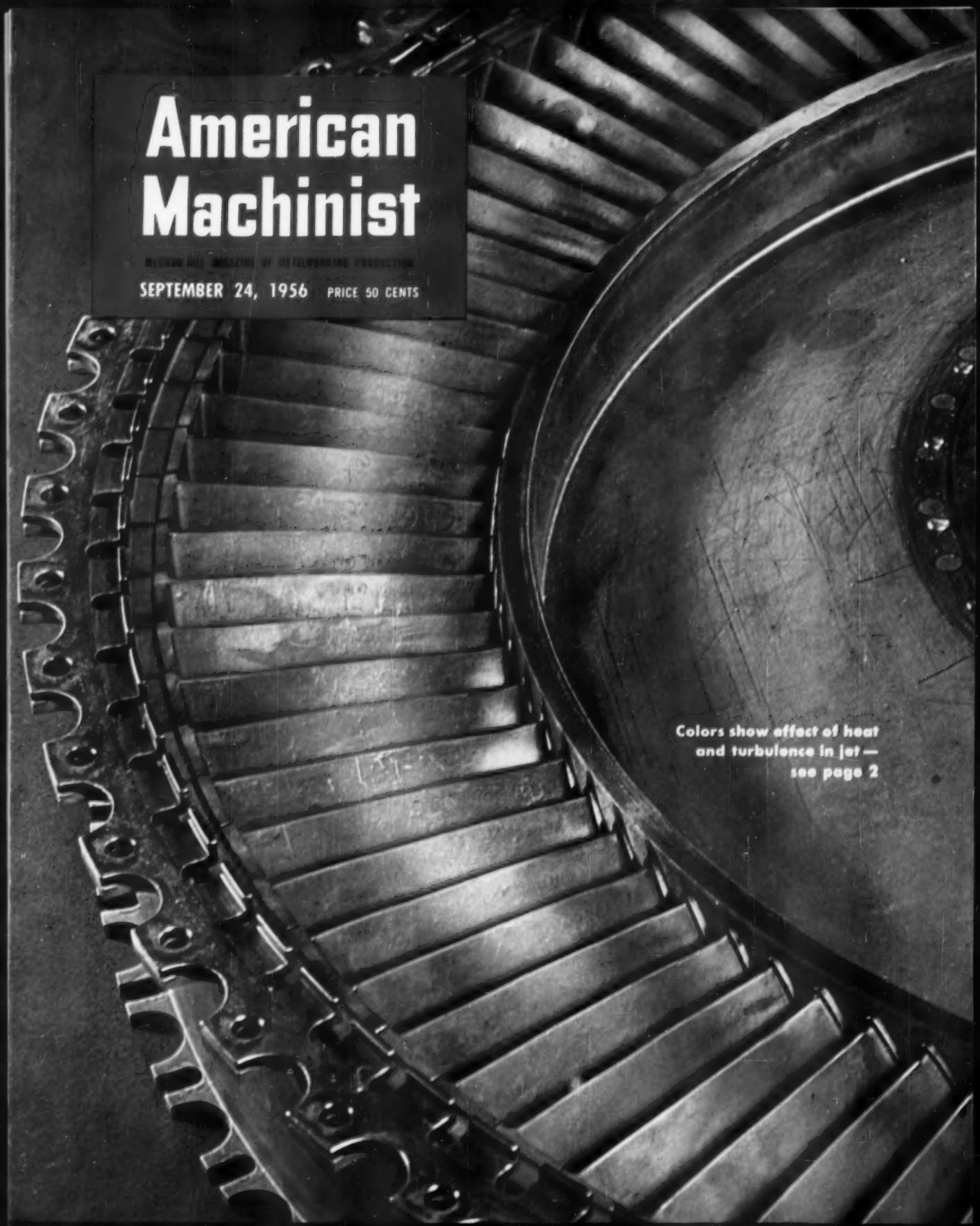


American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

SEPTEMBER 24, 1956 PRICE 50 CENTS

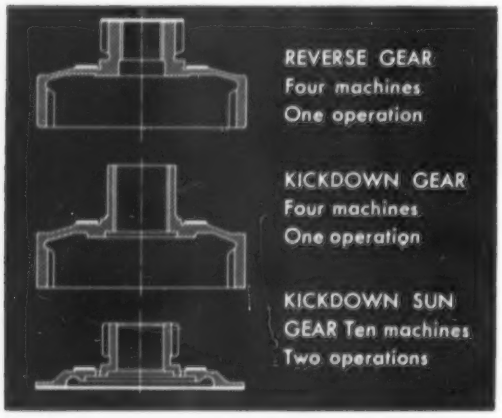
Colors show effect of heat and turbulence in jet—
see page 2

METAL SHOW ISSUE

Heald VERSATILITY in action

How STANDARD Rotary Surface Grinders do a PRODUCTION-LINE JOB

Eighteen Model 261s surface grind 3 different automatic transmission parts on a high-production basis



PRODUCTION-LINE speed and tool-room precision go hand-in-hand on a Heald Model 261 Rotary. Its automatic features make it an ideal machine for long runs of identical parts. This is well illustrated by an 18-unit lineup of 261s in a fast-moving production line at a large automatic transmission plant. These *standard machines* are surface grinding the three different gears shown at the left. All 18 machines have 12" chucks and magnetic workholding is used for all but one of the operations. The number of machines used for each operation depends on grinding time per part and required hourly production. There are 15 *other* Model 261s in this same plant, doing both *production-line* and *tool-room* work.

Available as either a Plain or Automatic cycle machine, the Heald 261 easily meets every requirement for long or short run rotary surface grinding work. For complete information, send for Bulletin No. 2–261–2, Issue 3.

It PAYS to come to Heald.

HEALD®

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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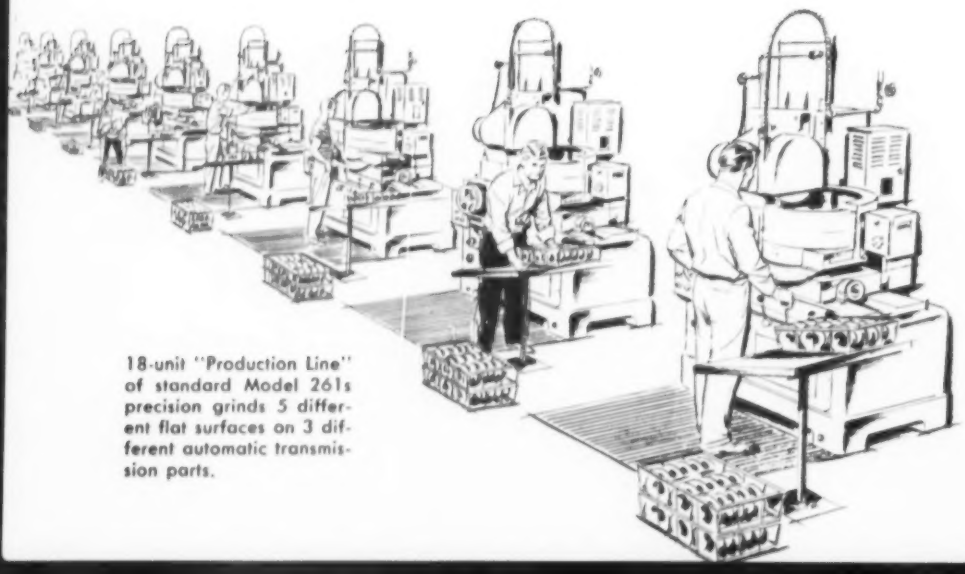
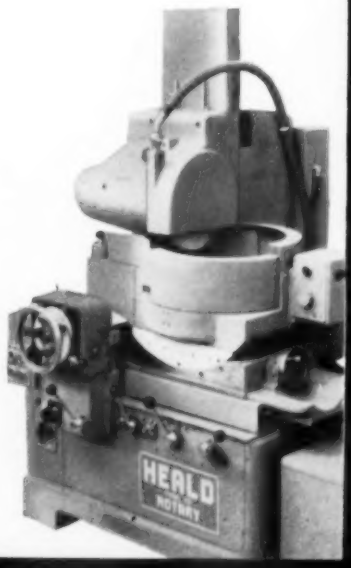


18-unit "Production Line" of standard Model 261s precision grinds 5 different flat surfaces on 3 different automatic transmission parts.



American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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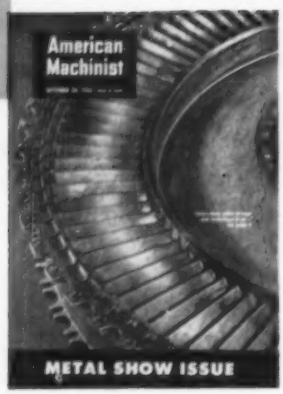

Cover . . .
Effect of heat discoloration on the second-stage turbine nozzle assembly of a J-57 turbojet at the Ford Aircraft Engine Division. Further details at left.

Color at work . . . Color pictures mean more than beauty in the Chemical and Metallurgical Engineering Dept at the Ford Aircraft Engine Division in Chicago. From photos like the one on our cover, oxidation colors are related to actual heats encountered. This makes it possible to determine whether overheat might have been a primary cause of engine failure, should it occur.

Temperature levels are critical in engine failure investigations, according to Merle F Valade, head of the department. They can be determined with surprising accuracy by analysis of discoloration on vanes, buckets, and nozzles. The cover picture was taken by Edward Prohaska, photographer in the "Chem-Met" department. A die-transfer print was made from the color transparency for study and we worked from this print to make our cover.

Metal Show time . . . If you plan to go to the show in Cleveland (Oct 8 to 12), this issue is for you. You'll find a summary of new materials and equipment being introduced at the show starting on page 176, and a quick rundown of the meetings of interest to production men on page 166. Most important, you'll find that the articles throughout this issue have been selected to cover the subjects uppermost in your thoughts at Metal Show time.

But if you have to tend the store, and someone always does, you'll find this issue even more useful. The summaries of what's going to be in Cleveland will be of special value if you can't go. And more to the point, you'll find that the articles were chosen *primarily* because they dealt with developments important to production men, and secondarily to tie with the Metal Show. We have long felt that, because more readers stay home than go to a show, we should never forget the men at home when we produce an issue tied to a show. This one is no exception. We suggest a close look at the group of articles on molybdenum in the Special Report. They include a summary of machining recommendations from Climax Molybdenum Co; two case studies of machining moly turbine wheels, one from A Wolff Co and one from Douglas Tool; a study of machining moly blades from Technical Service Co; and moly boring bars compared with steel by Nobles Engineering & Mfg Co.

Coming . . . *AM* for Oct 10 will offer the first details on the new production ideas that are being tried out this month in Detroit as production of '57 models begins. In addition, there'll be reports on turning in relation to surface finish, taper turning, screw-machine costs, and diamond cutting tools. Best of all, the Special Report will pierce the curtain of secrecy that has surrounded the cold nubbing of dies.

William D Miller was born in Buffalo and graduated from Carnegie Institute of Technology. He started with Wright Aeronautical as a production engineer, then spent ten years with the Atomic Energy Commission where his last assignment was as deputy manager of the Paducah (Ky) Gaseous Diffusion Plant. In 1954, he joined Continental Copper & Steel Industries, Inc, as chief engineer. Now he is assistant vice president and project sponsor for the Texas Towers. His article on the production of these towers is on page 141.

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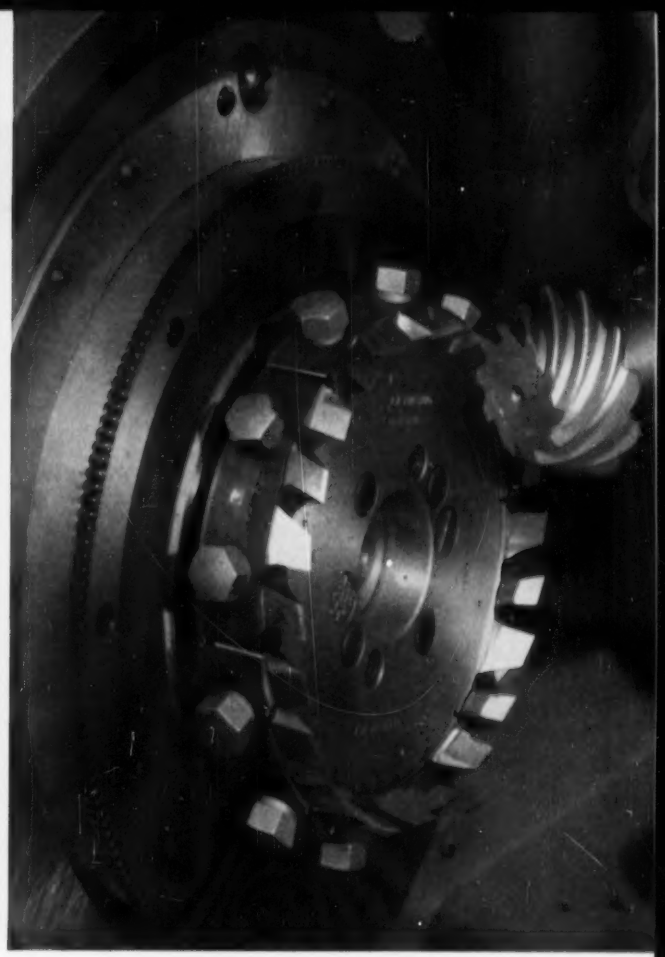

SPIRAL BEVEL GEAR

HYPOID PINION

How to produce both with just *one* cutter, *one* machine

These two parts alone show why the Unitool* Method is ideal for economical job shop operation, for trying new ratios, and for producing prototypes.

You need only one machine—either the No. 116 Hypoid Generator or the smaller No. 106—and one cutter to produce both parts.

You complete both parts from the solid before removing them from the machine.

Add just five more cutters and you are equipped to produce spiral bevel and Zerol® bevel pairs of any ratio, and hypoid pairs of 3:1 ratio and higher. You can cut any of these gears up to 18″ pitch diameter.

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No special training needed The operator uses direct common sense methods to set for the correct tooth thickness and position of contact. No lengthy, expensive training is necessary.

Fast change-overs You can switch to different sizes or types of gears in minutes. A calculated set-over is all it takes to get the right gear size. No other measurements are necessary.

Bulletins—Write for bulletins on the Unitool Method and the two generators which outline all the advantages of the method and explain its operation in detail.

With the Unitool Method you use just one cutter to produce the three types of gear pairs shown here. Such versatility cuts costs sharply on small-lot production.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

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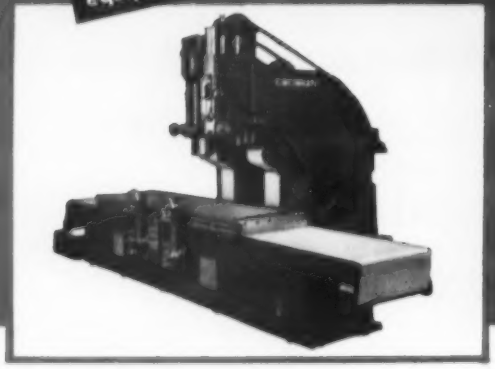
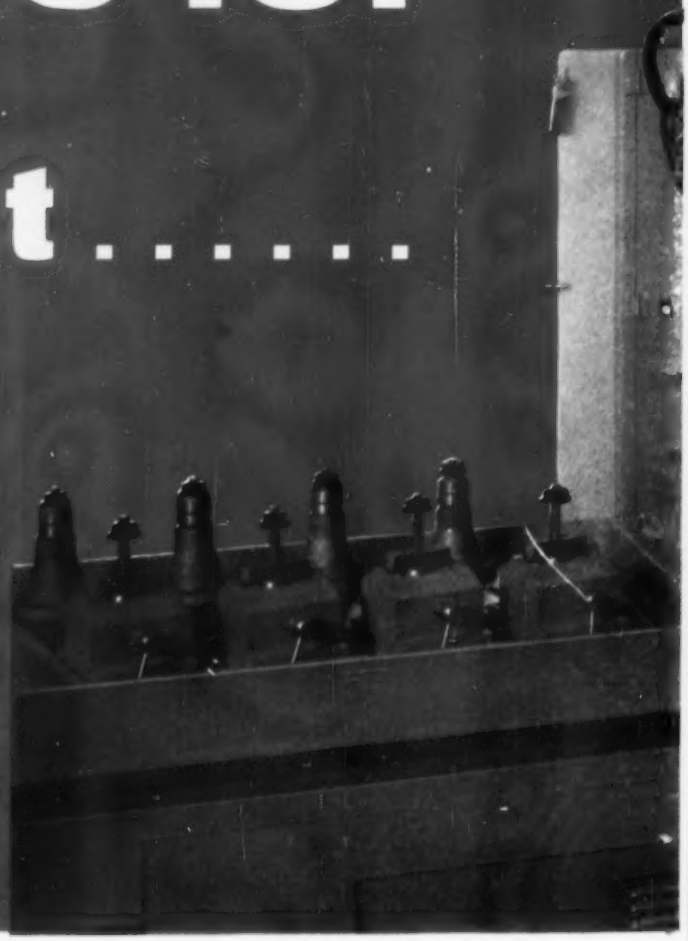
Place for Eight.....

CINCINNATI 28" VERTICAL HYDRO-TEL MILLING MACHINE

equipped for conventional milling





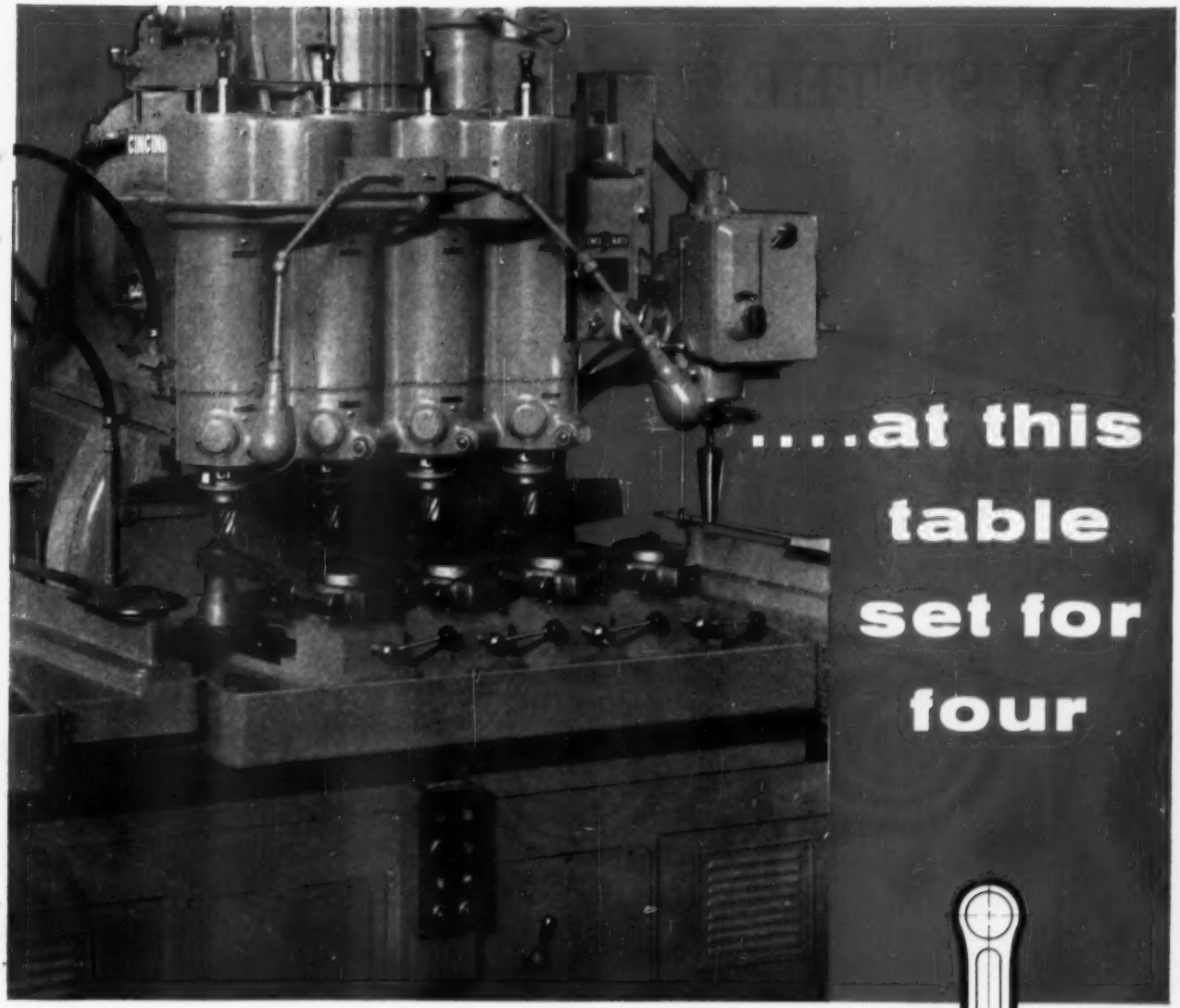
It's an established principle for methods engineers in the "know"... while one or a group of parts is feeding past the cutters, a second fixture mounted on the machine is reloaded for its turn at the feeding station. In many cases handling time chargeable to cost is practically nil.

Advantages of this principle are very much worth while for the milling operation illustrated here. A CINCINNATI® 28" Vertical Hydro-Tel, with 96" table traverse, is equipped with duplicate fixtures and a four-spindle head to automatically profile mill four connecting rods at one time. Surfaces milled are indicated in the drawing. This Hydro-Tel is equipped for 360° automatic profile milling, one of the seven ways in which Hydro-Tel machines are built for various types of work. The complete list includes:

1) **Conventional milling, low series spindle speeds**
2) **Conventional milling, high series spindle speeds**
3) **Die sinking**
4) **360 degree automatic profiling, non-selective**
5) **Die sinking and 360 degree automatic profiling, non-selective**
6) **360 degree automatic profiling, selective**
7) **Die sinking and 360 degree automatic profiling, selective**

28" Vertical Hydro-Tels have plenty of range for large work; 60", 96" or 120" table traverse; single spindle head or 2, 3 or 4 spindles. May we give you more information? Write for catalog M-1773-2. For brief specifications look in Sweet's machine tool file.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI

Drawing of part. Surface outlined is automatically profile milled in one continuous cut.

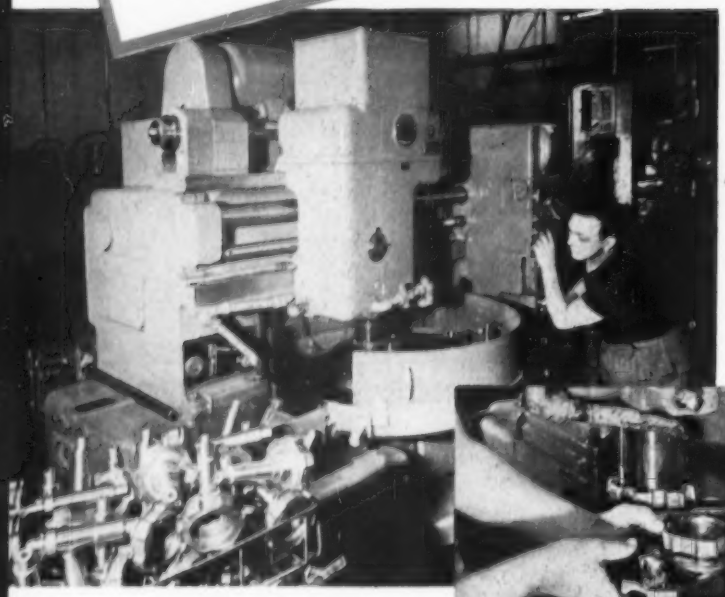
CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES
HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

JUST THE TICKET for Versatility

FELLOWS GEAR

New "540" Transmission, made for a major truck manufacturer, includes 22 gears . . . all produced on powerful, accurate Fellows Machines.



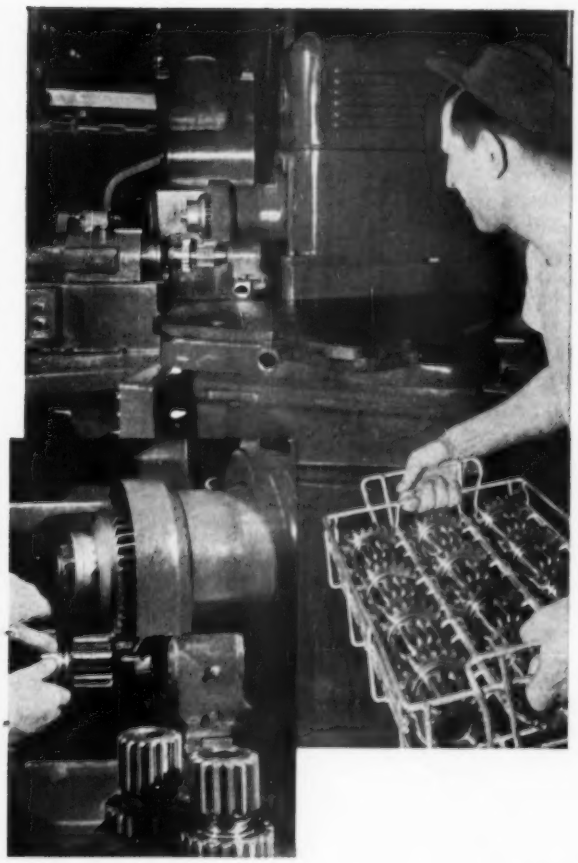
Fellows 36-Type Gear Shaper cuts all six lugs on this part in one operation . . . produces 135 finished parts per day.

Fellows No. 8 "Full-tool" Shaver produces 40 pieces per hour compared to 25 on previous machine.

THE PRECISION LINE

and High Production...

PRODUCTION EQUIPMENT



Products as varied in size as sewing machines and truck transmissions are made at the famous New Process Gear Company, major gear manufacturers for seventy years. They rely on versatile Fellows Gear Production Equipment for higher production schedules, increasing production and cutting costs more than 50% on many gears.

For example, Fellows 36-Type Gear Shaper, with a capacity up to 36" P.D., turns out gears in as little as *one-fifth* the time of the machine it replaced! Fellows No. 8 "Full-tool" Shavers increase production over 60% on most jobs. Semi-automatic fixture controls cut loading time nearly 50%. Other Fellows machines produce comparable savings on many New Process jobs.

For full information about the benefits of the complete Precision Line of Fellows Gear Production Equipment, get in touch with your Fellows Representative. Ask him, too, about the Fellows Plan for deferred payment. Write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
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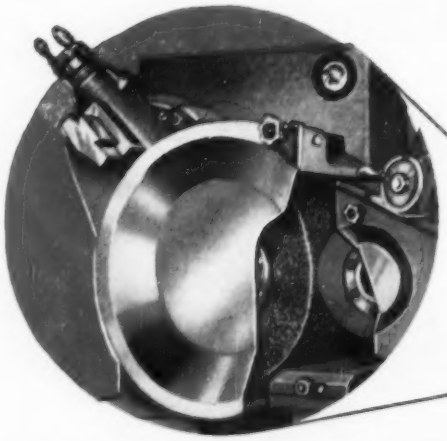
Fellows *Gear Production Equipment*

VAN NORMAN

New

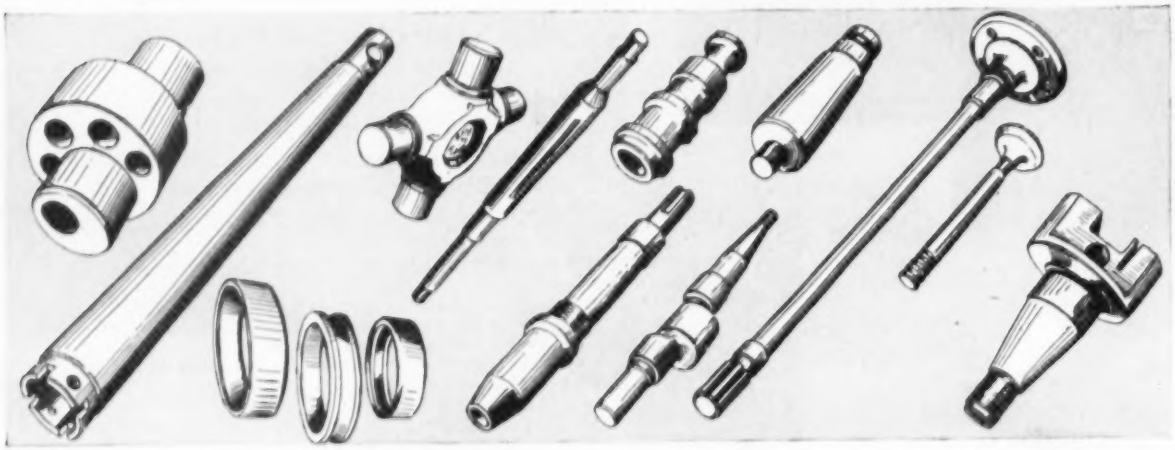


The new Van Norman No. 2C Grinder is *engineered* for fast, accurate, economical grinding of parts. Incorporated in the many outstanding features is the *15 HP* main drive motor which provides ample power for every grinding job. Couple this with the totally enclosed rugged grinding wheel spindle and you get close-tolerance smooth finishes plus chatterless, trouble-free operation.

Compare These Outstanding Features

- Hard chrome plating of regulating wheel slide after hand scraping, preserves original factory built-in accuracy.
- Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life, assuring chatterless trouble-free operation.
- Spindles require no warm-up period, eliminating "creep" which has always been a problem in grinding operations.
- Infinitely variable regulating wheel drive.
- Totally enclosed fan cooled, dynamically balanced 15 HP main drive.
- Independent hydraulic wheel truing devices for each wheel.
- Fine hand wheel adjustment on diameter of work piece.

Phone, wire or write for full details on the new Van Norman No. 2C Centerless Grinder.



Grind Parts Like These Accurately, More Economically

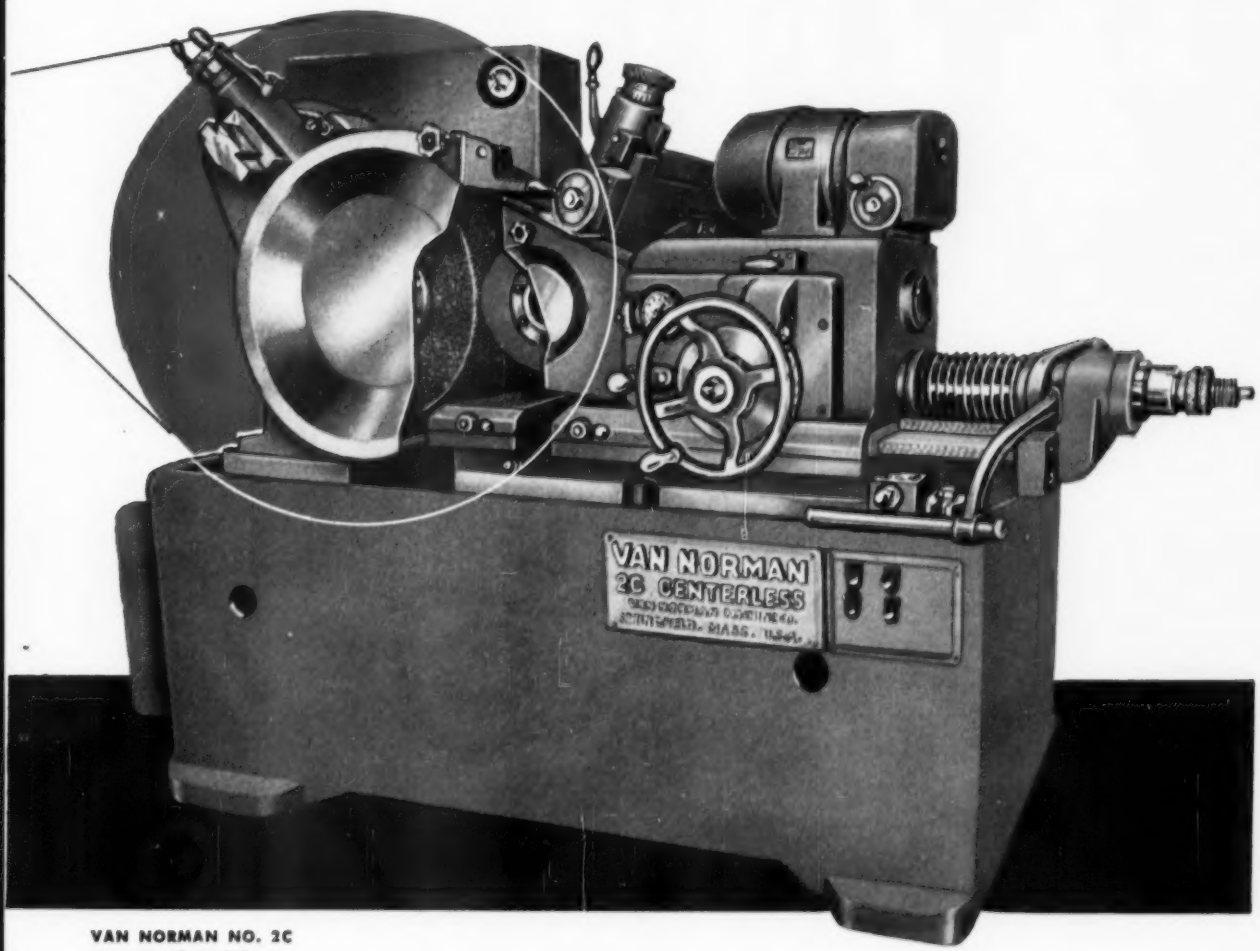
VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 2C Centerless Grinder

...Features 15 HP Main Drive

Assuring Precision, Close-Tolerance Grinding



VAN NORMAN NO. 2C
Capacity: 0" to 4¾"
Grinding wheels available: 24" x 4" x 12"; 24 x 6" x 12"; 24" x 8" 12"
Regulating wheels available: 12" x 4" x 5"; 12" x 6" x 5"; 12" x 8" x 5"
Automatic cycling and gauging available.

Don't wait . . . for extra profits install a Van Norman Machine now!
They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . See your dealer or write Van Norman Company. Conditional Sales Contracts not available to Export.

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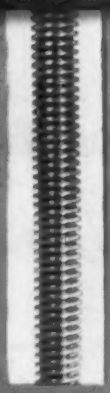
LANHYROL

THREAD ROLLING

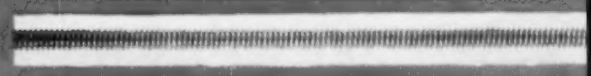
Field installations of the new LANHYROL Thread Rolling Machine are producing outstanding results. Production data from representative jobs, shown on the opposite page, indicate the unequalled output, flexibility, and range coverage of this revolutionary new machine, not available anywhere else in the Western Hemisphere.

The LANHYROL Thread Rolling Machine produces strong, accurate threads of excellent finish by the chipless, cold-forming process using four different Rolling Methods—Thrufeed, Infeed, Continuous, and Reciprocal. It will thread all diameters from $\frac{3}{16}$" to 3", producing left- and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms.

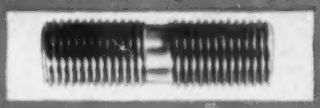
Additional information on request—please send specifications and ask for Bulletin E-60.



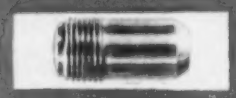
WORKPIECE: Jack Screw
MATERIAL: C1018 Steel
THREAD SPECIFICATIONS: 1"-5 pitch 29° Acme
TOLERANCE: Class 4C
METHOD: Thrufeed Rolling
PRODUCTION: 30" per minute (rolled in 36" lengths—can be rolled in 12" lengths)



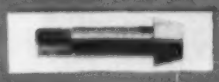
WORKPIECE: Timer Switch Leadscrew
MATERIAL: B1112 and C1117 Steel
THREAD SPECIFICATIONS: ¼"-16 Pitch Standard Acme
TOLERANCE: Class 2G
METHOD: Thrufeed Rolling
PRODUCTION: 46" per minute (rolled in 18" lengths—can be rolled in 12" lengths)



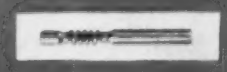
WORKPIECE: Double-End Stud
MATERIAL: C1040 and SAE 8620 Steel
THREAD SPECIFICATIONS: 2"-4½ pitch NC—3" thread length
TOLERANCE: Class 3
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 1½ min. rolling time per piece (both ends)



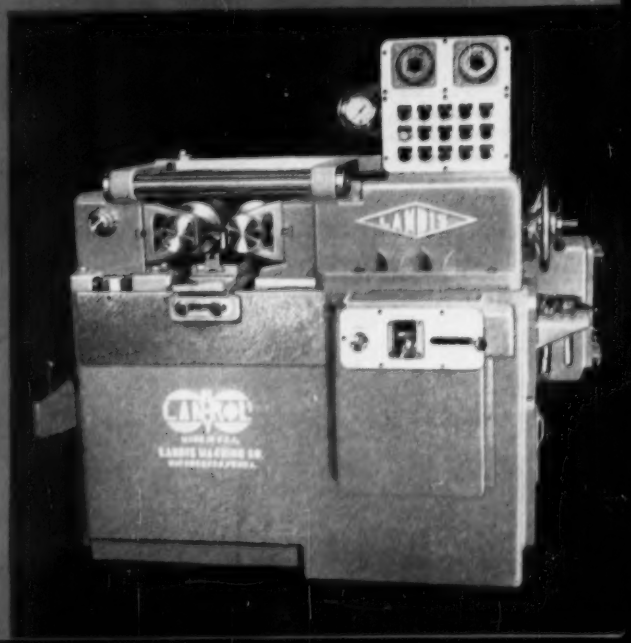
WORKPIECE: Barrel—MG Gun Perforator
MATERIAL: .60 Carb. Silicon Tool Stl.
THREAD SPECIFICATIONS: 1⅜"-6 pitch Stub-Acme—1" thread length
TOLERANCE: Class 3G
METHOD: Infeed Rolling (hand-operated work-holding fixture)
PRODUCTION: 15 pieces per minute



WORKPIECE: Aircraft Bolt
MATERIAL: 4340 Steel of 35-40 Rockwell C
THREAD SPECIFICATIONS: 1"-14 pitch NF—1-5/16" thread length
TOLERANCE: Class 3A (Military Spec. MIL-S-7838-A)
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 10 pieces per minute



WORKPIECE: Transfer Drive Worm
MATERIAL: Stainless Steel
THREAD SPECIFICATIONS: ¼"-26 diametral pitch, left-hand, single—¾" thread length
TOLERANCE: .1825—.1805 P.D.
METHOD: Infeed Rolling (manual loading)
PRODUCTION: 20 pieces per minute

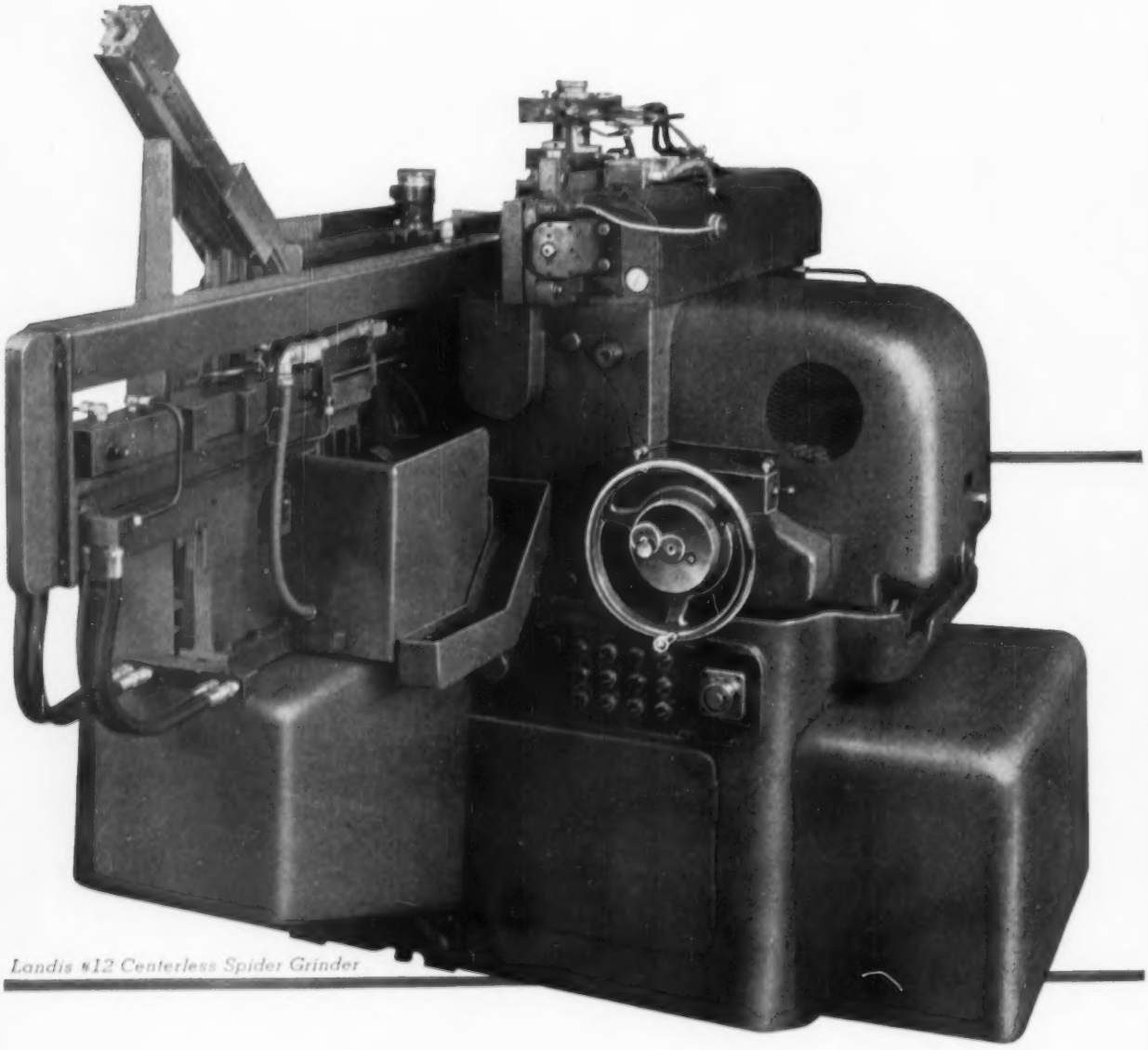


LANDIS Machine COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Automatically centerless grinds four diameters

Landis design and tooling solves unusual grinding problem...



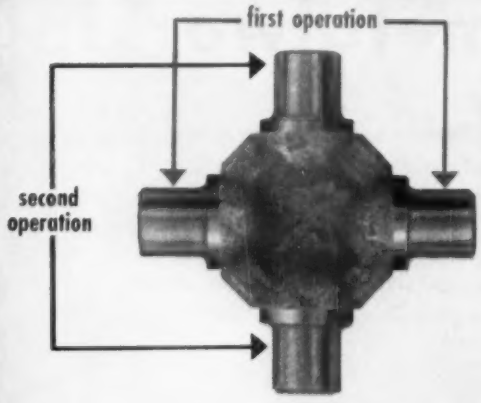
Landis #12 Centerless Spider Grinder

LANDIS

precision grinders

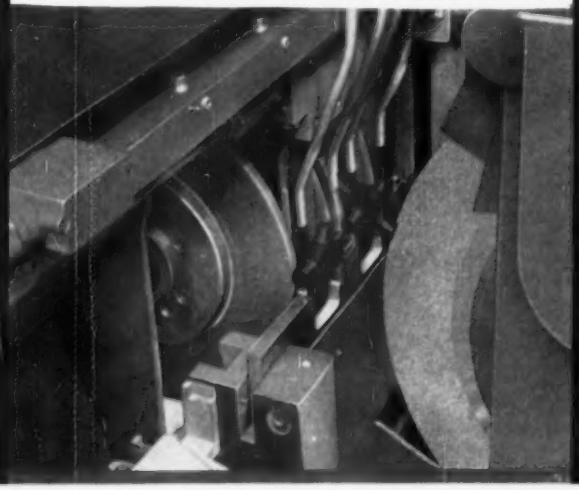
and adjacent radii in one loading

at lower cost per unit



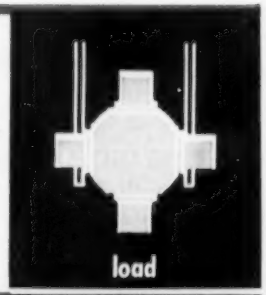
Stock removal on 4 diameters of universal joint spider is .010" to .012". Production is 250 complete pieces per hour.

Two universal joint spiders in grinding position.

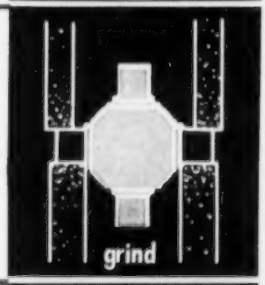


sequence of operation*

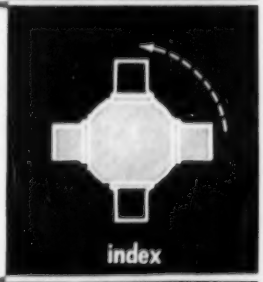
Carrier picks up workpiece, moves it to grinding position.



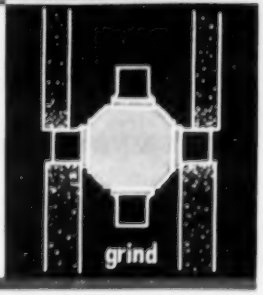
Automatic infeed grinding cycle grinds two diameters and adjacent radii.



Carrier removes workpiece, indexes piece and moves it to second grinding position.



Automatic infeed grinding cycle grinds other two diameters and adjacent radii. Workpiece is automatically discharged.



*Only one spider is shown in simplified work sketches, but machine actually handles two workpieces simultaneously. This is an example of how Landis designers can apply unusual tooling for the practical solution of grinding problems.

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Today's *Smartest* approach to more profitable metalworking

UNLIMITED profit-making opportunities begin with Giddings & Lewis 300-T (table-type) horizontal boring, drilling and milling machines. Acclaimed the most versatile machines for their size ever built, they're capable of performing a host of machining operations with efficiency and precision. And you get even greater production results from a combination of attachments and accessories — designed to increase the normal working range of the machine.

The 300-T machines (with 3-inch diameter spindle) are available with standard or built-in revolving tables with a wide variety of working ranges. Machines also feature rigid saddle supports . . . in-the-floor or over-the-floor type auxiliary runways . . . large bearing surfaces between the headstock and column which permit the machine to work at full capacity at the extreme limits of travel.

What's more, its 45 optional spindle speeds and 18 feeds in any speed range, augmented by a total of 23 milling feeds, exceed the requirements of modern shop practices and available tooling development. Find out how the 300-T outperforms any other horizontal built today.

Write for literature: **For complete specifications on Giddings & Lewis Models 300-T (table-type) and 300-RT (rotary table-type) machines, ask for Catalog No. 300-T.**

300T table type

Giddings & Lewis

horizontal boring, drilling and milling machines

Advanced design features plus an extensive line of optional equipment and accessories

G&L HYPRO

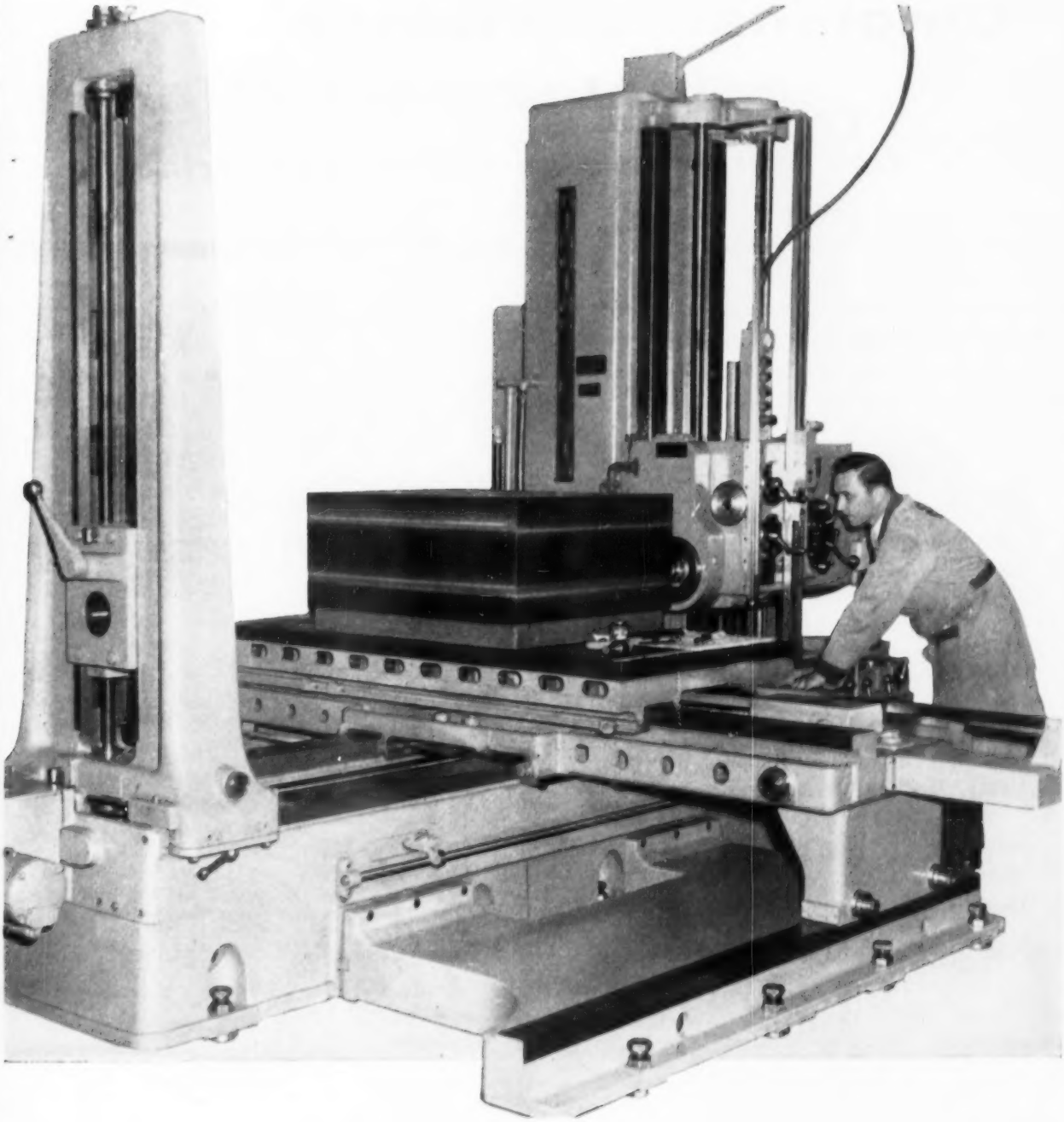
G & L *and* HYPRO DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

Fond du Lac, Wisconsin

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Vertical Turret Lathes; Spar and Skin Milling Machines, and VARIAX Machines.

O-59



EXTENDED SADDLES, SADDLE SUPPORTS and AUXILIARY RUNWAYS assure maximum rigidity and accuracy under heaviest loads . . . available with in-the-floor or over-the-floor auxiliary runways.

HEADSTOCK, TABLE, SADDLE operate independently in both directions of travel. Directional controls provide for easier operation of machine units. Heavy, box-type ribbing in column assures extra-rigidity for headstock.

SURFACE HARDENED WAYS on the bed and saddle prevent scoring and galling . . . assure longer-lasting accuracy.

COMPLETE SEPARATION OF CONTROLS plus color-coded, speed and feed dials simplify machine operation . . . considerably reduce floor-to-floor time.

PENDANT STATION with push-button controls permit machine operation at any point within operator's normal working range.

PRECISION MEASURING DEVICES are available for movement of headstock, table and saddle.

ANGULAR MILLING ATTACHMENTS permit many different milling, boring, reaming and similar operations.

CONTINUOUS FEED FACING HEAD simplifies unusual or complex work where surfaces to be machined are beyond normal range of machine.

AUTOMATIC ELECTRIC POSITIONING DEVICE accurately selects, maintains and controls distances between machined holes. Makes possible positive machine settings for boring operations repetitive to .0002"

Cincinnati Combines Quality Control and

for Your Precision Centertype Grinding

Every shop wants closer control of quality and production. It's especially desirable for final operations, when cost per unit nears its maximum. In the field of precision centertype grinding on 6" to 14" machines, CINCINNATI'S[M] standard and extra features combine quality control and production control into a unified, automatic function of the machine. You will be interested in knowing why:

No adjustment of grinding wheel spindle bearings required for any job setup. FILMATIC bearings are self-adjusting.

Grinding wheel is automatically balanced in a few seconds, on the machine, at operating speed.

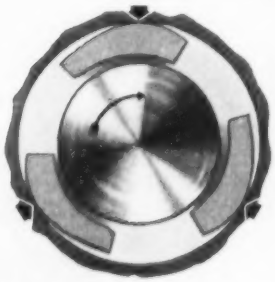
*Automatic Air-Electric Gage Sizing incorporates cycle time stabilizer. As the wheel wears, original length of cycle is automatically maintained.

The non-productive time spent in "cutting air," occasioned by variations in grinding stock, is greatly reduced by the *Gap Eliminator feature. The actual grinding rate starts only when the wheel contacts the work.

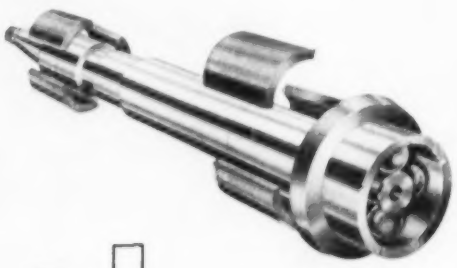
The above cost-control features and many others are outlined in two attractive catalogs: No. G-660-1 for the CINCINNATI FILMATIC 6"R and 10"L Plain Hydraulic Grinding Machines. No. G-661 for the 10"R and 14"L Machines. Write for copies, or look in Sweet's for brief specifications.

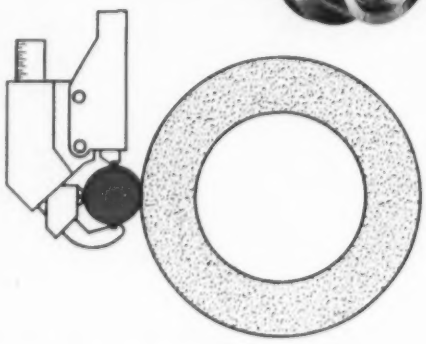
*Extra Cost

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



FILMATIC Grinding Wheel Spindle Bearings and Grinding Wheel Balancing are standard equipment. (FILMATIC principle illustrated above.) These two cost-reducing features alone are reason enough to choose CINCINNATI.

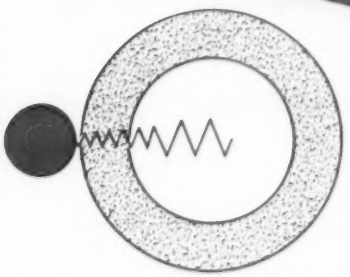




Automatic Air-Electric Gage Sizing (extra) includes an exclusive CINCINNATI advantage . . . cycle time stabilizer for wheel wear and truing.

CINCINNATI

Production Control



Gap eliminator . . . greatly reduces time spent in "cutting air" during automatic in-feed grinding operations. (extra)

Members of this family group of CINCINNATI® FILMATIC Plain Hydraulic Grinders are:

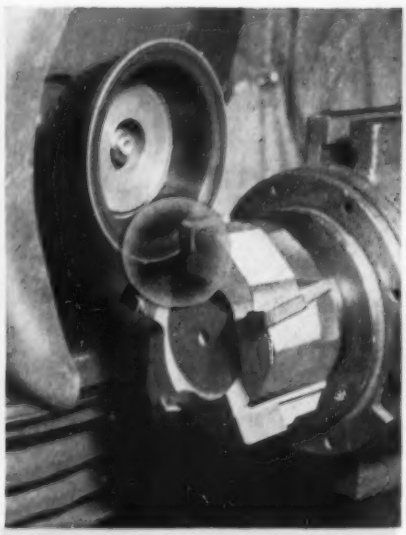
Size	Between-Center Lengths	Catalog
6"R } 10"L }	18" and 30"	G-660-1
10"R } 14"L }	18", 36", 48" 72" and 96"	G-661

CINCINNATI FILMATIC
6" R x 18"
Plain Hydraulic Grinding Machine
Equipped with Quality Control and Production Control

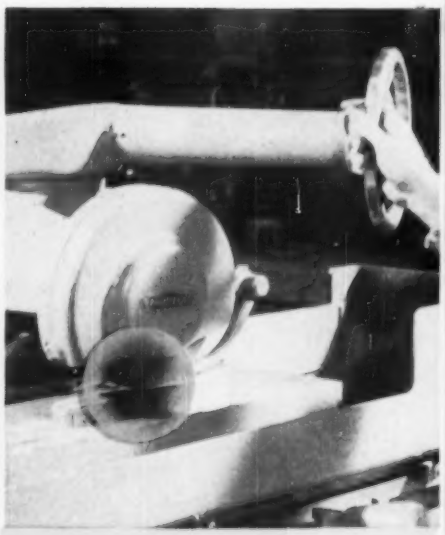
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Add the "Touch of Gold" to

Tool Sharpening



Carbide Grinding



Surface Grinding

. . . with precision processed,

Norton makes wheels for every grinding job in your tool room — and precision-processes them on the most advanced equipment and with the most experienced "know-how" in the field. The result is precise wheel duplication, longer wheel life, and the same money-saving "Touch of Gold" performance every time you re-order.

Top performers from the 100% line of Norton wheels for tool room grinding include:

G Bond Wheels. Made with the most efficient vitrified bond ever produced for precision and semi-precision grinding. For sharpening and for surface, cylindrical and internal grinding on all steels, use G Bond wheels in the exclusive 32 ALUNDUM* abrasive, 38 ALUNDUM abrasive or 19 ALUNDUM abrasive.

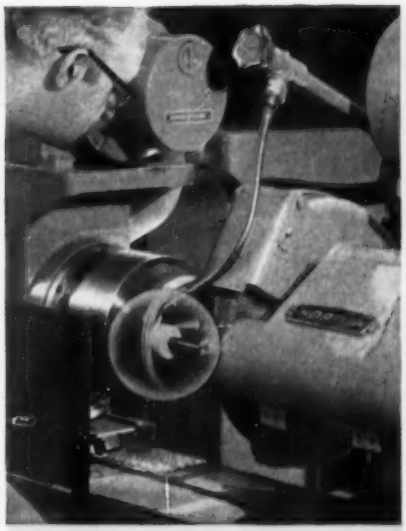
Diamond Wheels by Norton are the recognized "Crown Jewels" for carbide grinding — backed by long leadership in diamond wheel development and manufacture. Made in the regular B resinoid bond for wet grinding and the B6 resinoid bond for dry grinding.

K Bond Wheels in CRYSTOLON* abrasive are an excellent investment for carbide grinding. The vitrified K Bond, in half-grade hardness increments, enables you to "pin-point" specifications.

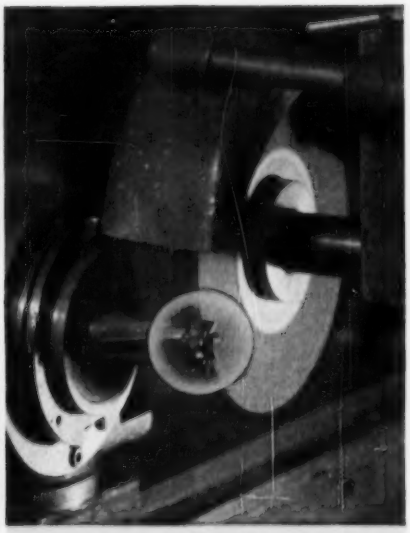
Cut-Off Wheels made in abrasive-and-bond combinations for all tool room applications, wet or dry, on every type of machine.

every tool room grinding job

Cylindrical Grinding



Internal Grinding



Cutting-Off

precision duplicated Norton wheels

Remember: Norton makes tool room grinding machines as well as wheels . . . knows how to build wheels to machine requirements . . . and offers you the longest experience in both grinding machines and grinding wheels to help you produce more at lower cost. See your Norton Distributor for aid in wheel selection and a copy of the new revised handbook on tool room grinding. Or write to the nearest District Office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON

ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cat Tapes

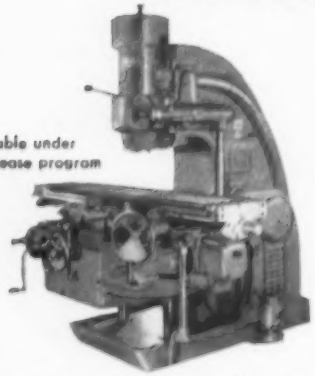
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1731

Now Kearney & Trecker has

TF Series milling machines — front-mounted for faster table settings... positioned to prevent costly errors

Standard equipment on new



Available under Tool-Lease program

TF Series Model 550 Vertical Milling Machine

POWER — 50/25 spindle drive; 5hp feed and rapid traverse drive
TABLE WORKING SURFACE — 96" x 18"
FEEDS — (32) ⅛" to 90"
SPEEDS — (16) single-speed, (32) two-speed
WEIGHT — 17,600 lbs.

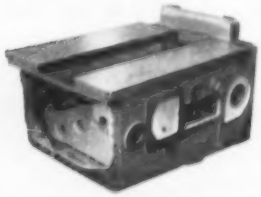
THE front-mounted table handwheel is a standard feature on all Kearney & Trecker new TF Series, knee-type milling machines — Plain, Universal and Vertical. Mounted on the right front of the saddle and projecting diagonally, the newly positioned handwheel is a part of Kearney & Trecker's up-front central control grouping.

Because the handwheel is ideally located so as to simplify operation of the machine, the operator makes table settings more accurately — in less time and without leaving his normal operating position. It measurably reduces operator fatigue.

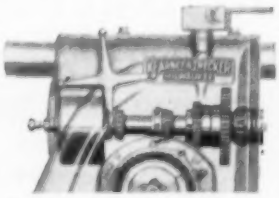
In addition, the new TF's give you a combination of more outstanding design and operating features (illustrated below) than any other knee-type milling machine on the market today. They're available in five sizes — No. 2 to No. 6 from 10hp to 50hp.

For complete specifications, and what these TF's can do for you, see your nearest Kearney & Trecker representative, or write direct to Kearney & Trecker Corp., Milwaukee 14, Wisconsin.

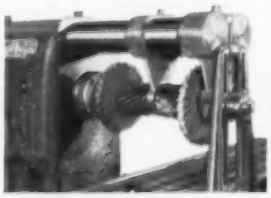
5 more reasons why TF Series milling machines are so easy to operate



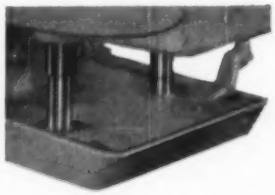
Heavier, Wider, One-Piece Knee — The Twin Screw arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . longer-lasting accuracy.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, fly-wheel, train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life and quieter operation.



Double "Vibra-Void" Overarms—Two solid steel bars, mounted completely through column, void vibration at source, afford more rigidity and resistance to deflection. Design also greatly simplifies changing of arbors and cutters.



Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of the new machines' much larger, wider, heavier knee, saddle and table. This balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . halves the wear factor, assuring greater, longer-lasting accuracy.

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

KEARNEY & TRECKER CORP.
6786 W. National Ave., Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on the new line of TF Series Plain, Universal and Vertical milling machines.

Name.....

Title.....

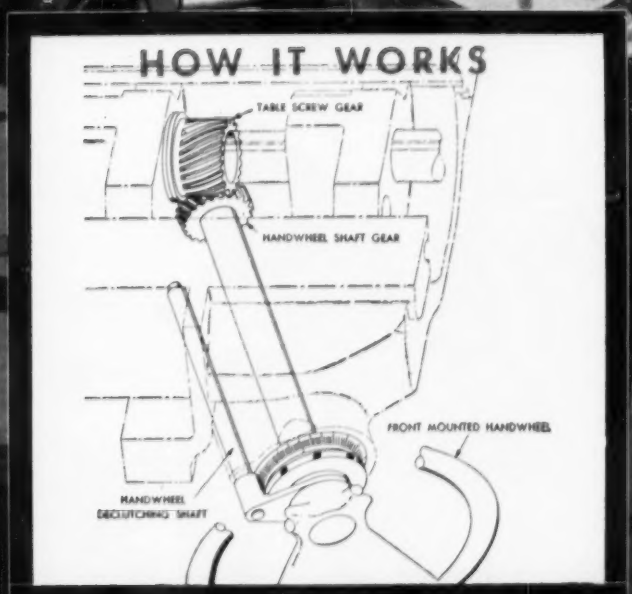
Company.....

Address.....

City..... Zone..... State.....

(convenience-engineered)

Front-Mounted Handwheel



KEARNEY & TRECKER
MILWAUKEE

BUILDERS OF
PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

PRODUCTION RECORD
PART
PART NAME
OPERATIONS
PRODUCTION INCREASE
¾" Clamp Socket
Turn, Face, Counterbore, Chamfer, Thread
136.4%
Face, Round, Turn
226.3%
Tap Body
Drill (2), Face (2), Tap (1), Chamfer (2)
47.5%
Drill, Turn, Thread
45.9%
¼" Air Cock Body
Turn, Drill, Thread, Chamfer
26.6%
Bottom Flange
Drill, Turn, Face, Neck, Thread, Chamfer
37.0%
Air Distributor Body
Drill, Tap, Chamfer
59.7%
Water Faucet Body
Drill, Neck, Recess Tap, Thread, Chamfer, Seat
49.4%
Drill, Form, Face
45.4%
Drill, Face, Form Tap, Chamfer
50.9%
Air Regulator Body
Drill, Recess, Turn, Face, Thread
86.2%
Drill, Tap
26.6%
Solid Tap Nut
Counterbore, Tap
70.3%
Tap Bottom Body
Drill, Face, Counterbore, Tap
28.0%

74.9% AVERAGE PRODUCTION INCREASE WITH WARNER & SWASEY ELECTRO-CYCLES®!

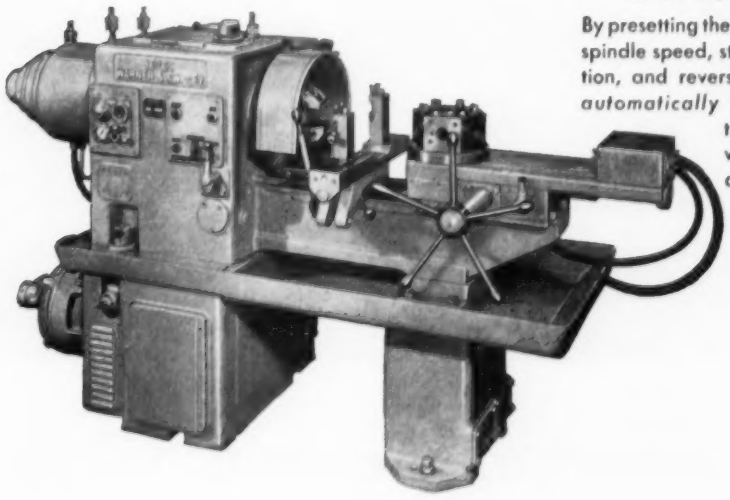
THESE PARTS are typical of the many different jobs machined in one brass shop on Warner & Swasey Electro-Cycle Turret Lathes.

Ranging from 2 to 6 operations, in lots from 100 to 10,000, each part is machined faster—*more profitably*—on the easier operating Electro-Cycles. The chart shows the exact results.

Electro-Cycles have made equally as impressive records in hundreds of other machine shops, turning non-ferrous metals and plastics. A new, improved 2-jaw air-operated indexing chuck now offers you even greater savings. Ask our Field Representative to show you how Electro-Cycles can speed production and build profits for you.

WARNER & SWASEY
16″ ELECTRO-CYCLE TURRET LATHE
1⅛″ Bar Capacity—16⅛″ Chucking Swing

By presetting the Electro-Cycle "drum control", spindle speed, starts and stops, spindle direction, and reverses for each turret face are *automatically* controlled. Operator zips through precision operations, without tiring himself on time-consuming manual operations.

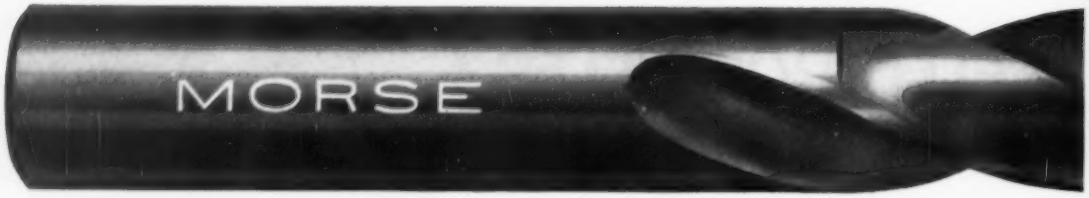


WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Another

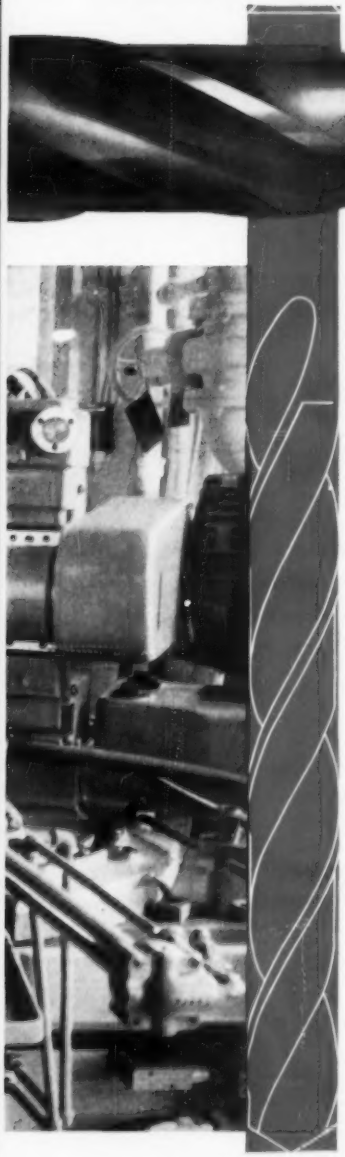
NEW FLUTE GRINDERS ARE



Still another Reason why

Morse First

THE FIRST OF THEIR KIND...



Now grinding from the solid up to 1/2 inch

And, here's what it means to you:

★ Smoother finish . . . better than polished flutes!

★ Consistently held tolerances . . . never attained by milling!

★ Better points . . . because of uniform flute depth!

★ Longer tool life . . . lower cost per hole!

This is why the new Morse flute ground drills are setting a new standard for quality . . . and, the only man who can show you is your Morse-Franchised Distributor.

MORSE TWIST DRILL & MACHINE COMPANY
New Bedford, Massachusetts

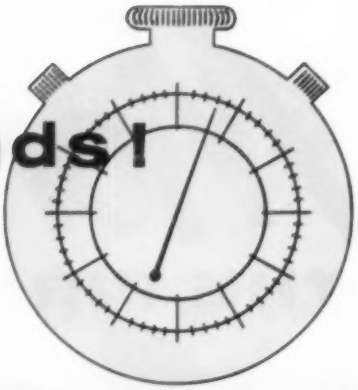
Subsidiary of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE *means* "THE MOST" *in Cutting Tools*

one every 3 seconds!

20 per minute!!

1200 per hour!!!



The world's largest supplier of

years ago established LAPOINTE -BROACHING

Fast production of parts is a *must* in the automotive industry, and one of the items requiring exceptionally high production *at low cost per unit* is this piston pin. Surface finish and dimensional accuracy also are of prime importance.

The versatile, flexible LAPOINTE VU-5 Broaching Machine is used for broaching a wide range of sizes of these piston pins, with unlimited combinations of O.D., I.D., and length. Fixture changeovers and tool changes are easily made.

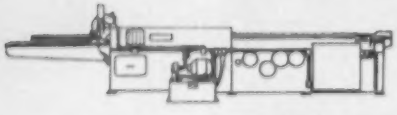
If you require mass-production of small precision parts, such as bushings, shock absorber tubes, small cylinders, small gear blanks and similar production parts, you should convert to LAPOINTE-Broaching! Investigate the series of LAPOINTE Vertical Broaching Machines. Built *heavy, rigid and rugged,* they have variable speed and are available in 5 sizes: 10- to 25-ton capacity, 36- to 60-inch stroke.

THE LAPOINTE MACHINE TOOL COMPANY

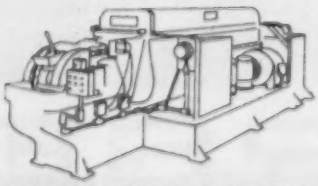
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

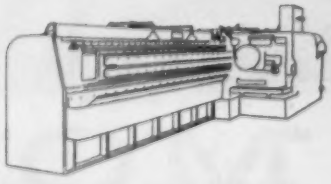
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



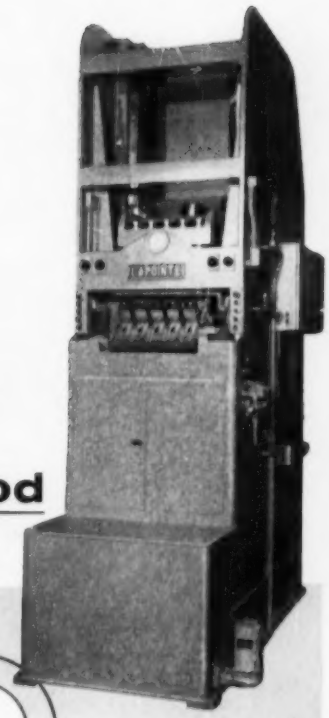
60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

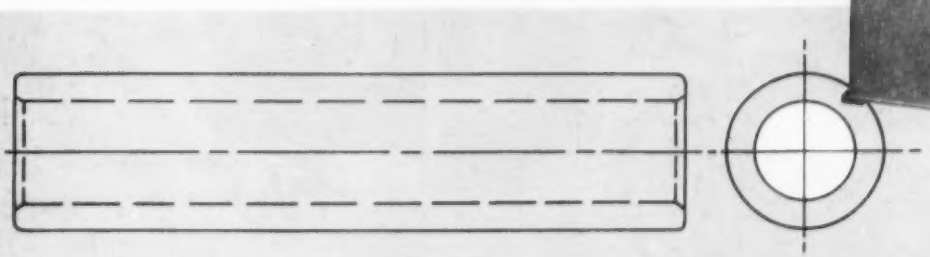


SRHE SINGLE RAM HORIZONTAL, ELECTRIC

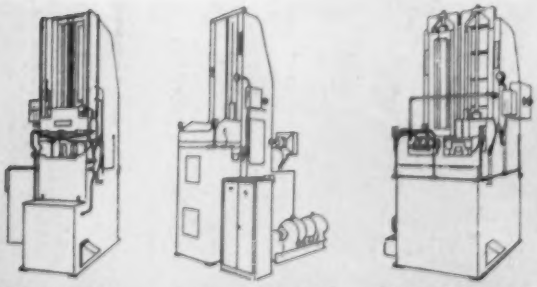


AUTOMOTIVE PISTON PINS

as the standard...the best method of finishing the inside diameter!



Broaching 5 parts at a time, this machine uses a LAPOINTE-built hydraulically operated fixture which is readily adjustable for the different diameter parts. Manually loaded. After broaching, the pins are released into delivery chutes. Machine uses a 48-inch stroke, and broaches at a speed of 40 feet-per-minute. Stock removal is 1/16". During the broaching stroke, the machine is completely closed in front, affording complete protection to the operator from oil spray; on the return stroke the oil flow is stopped.



VUB-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

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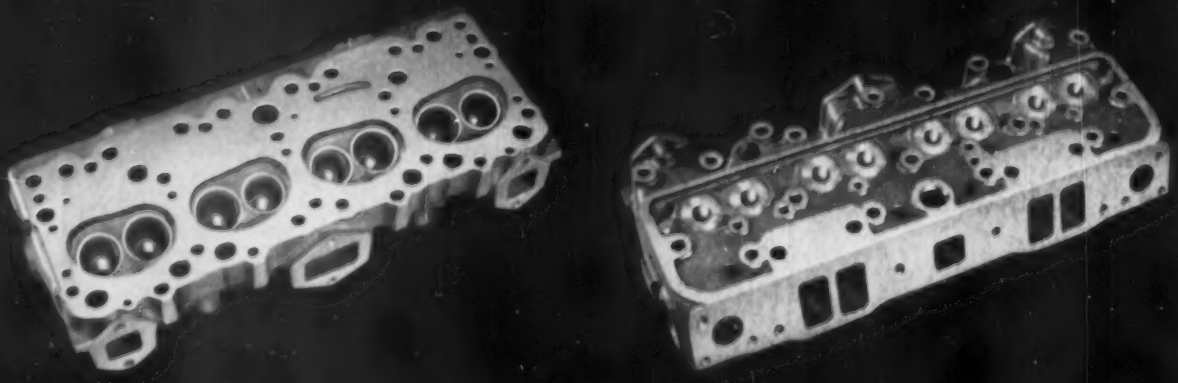
known to be the best in

BROACHING

Introducing

Sectionized Automation with *Automatic Banking* for V-8 Cylinder Heads

Section III



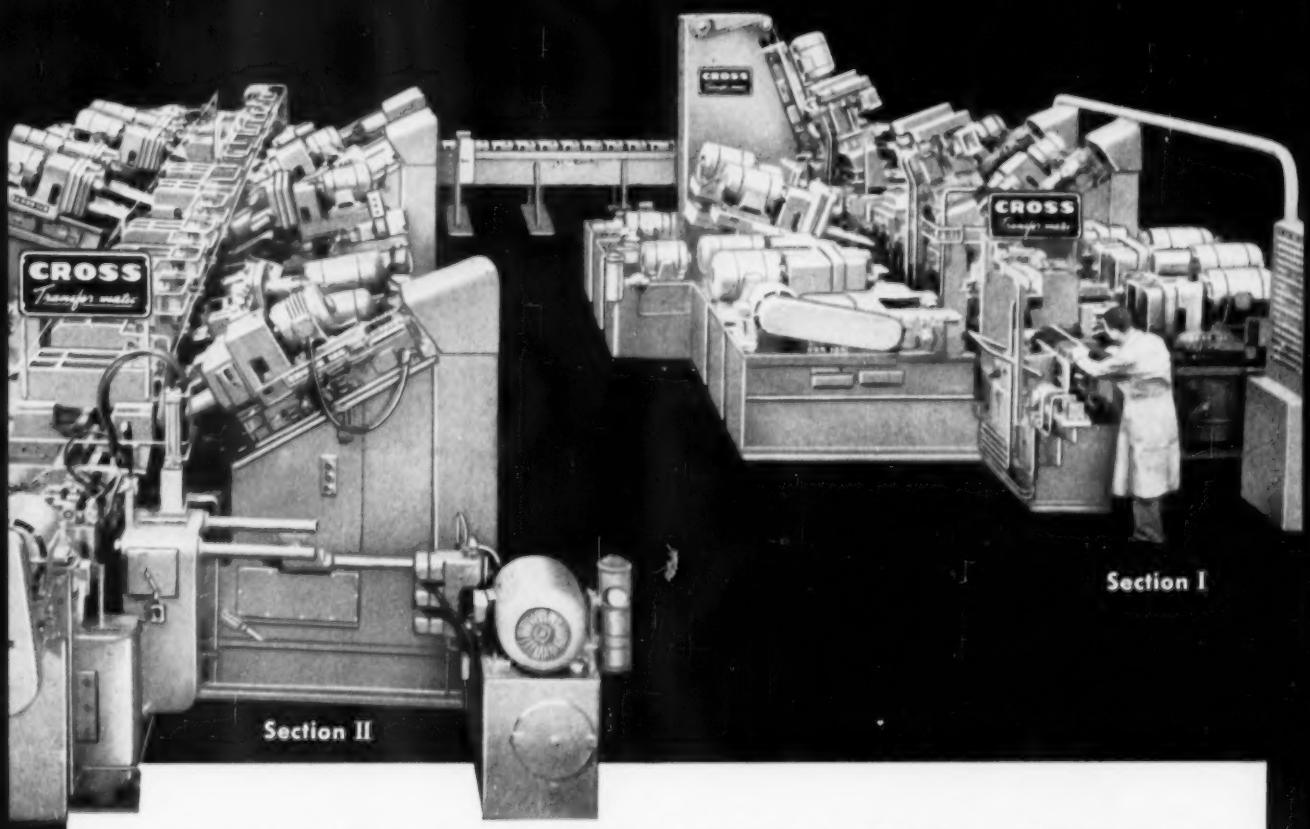
Established 1898

THE CROSS CO.

First in Automation

DETROIT 7, MICHIGAN

Another Automation First by Cross



This *Sectionized* Transfer-matic for machining V-8 cylinder heads is the first in the industry to utilize automatic banking to reduce downtime.

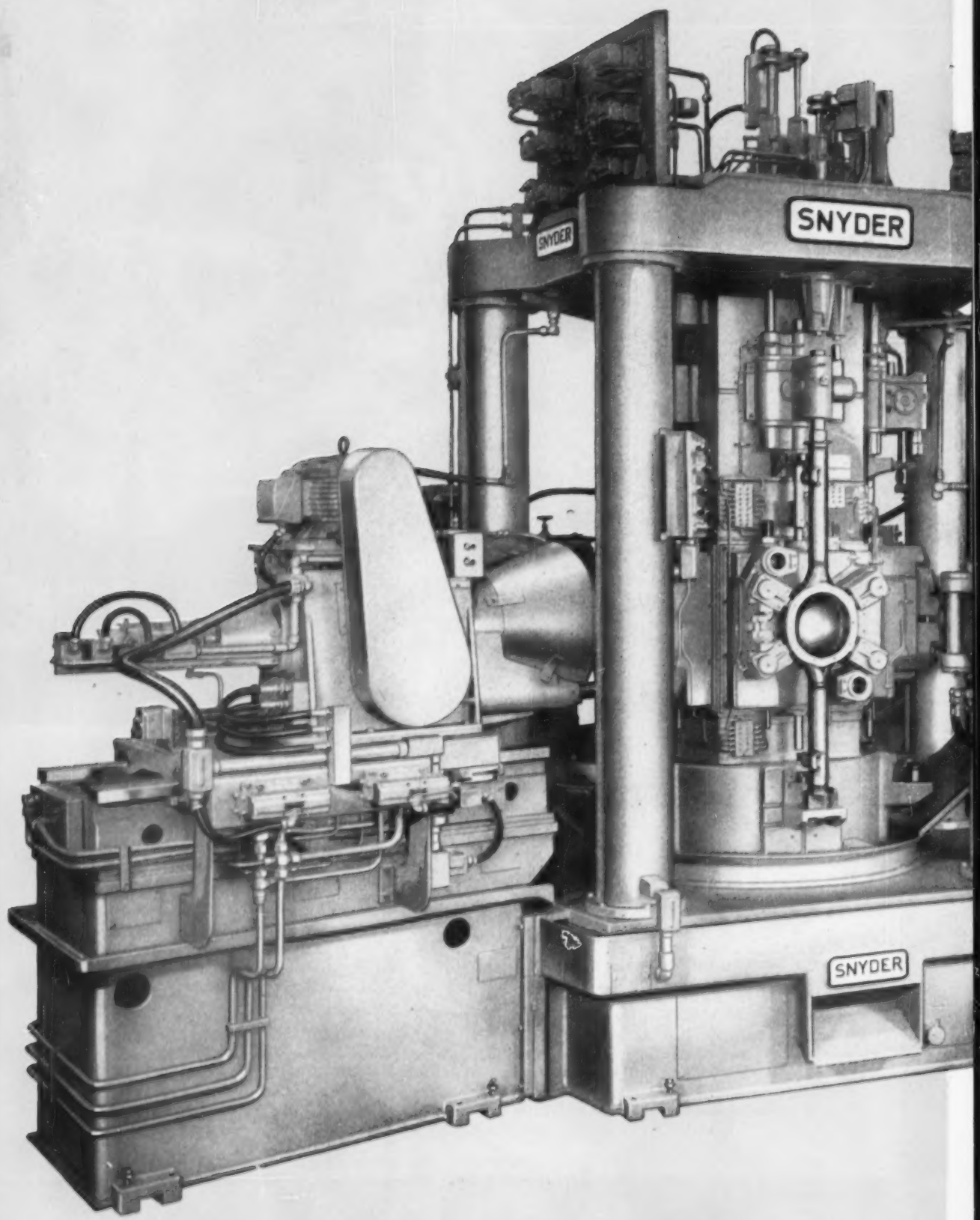
Key to the increased operating efficiency of this machine is its division into three sections and the use of two banking units—one at the rear between Sections I and II and the other in front between Sections II and III.

The first banking unit holds up to 35 pieces and feeds Section II. The second feeds Section III.

If production is interrupted in Section I for tool changing or maintenance, Sections II and III continue to operate as they receive parts from the two banking units. If Section II is stopped, the first banking unit stores the overflow from Section I and the second unit continues to feed Section III. If work in Section III is interrupted, the second banking unit receives and stores the parts from Sections I and II. The ability to shut down any one of the sections while the others continue to operate results in greatly increased production efficiency.

The entire line performs 461 operations on each of 144 cylinder heads per hour at 100% efficiency—213 in the 11 stations of Section I, 154 in the 16 stations of Section II and 94 in the 13 stations of Section III. This completes all operations except broaching.

Other features are: Construction to JIC standards, hardened and ground ways, automatic lubrication, automatic chip disposal, pre-set tooling throughout and Cross Machine Control Units to program tool changes.


SNYDER
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SNYDER VERTICAL TRUNNION MACHINE

for processing rear axle housing assembly; rough and finish faces banjo face, combination drills and reams ten holes in banjo face and chamfers both sides of holes. Production: 105 pieces an hour at 100% efficiency.

SNYDER

TOOL & ENGINEERING COMPANY

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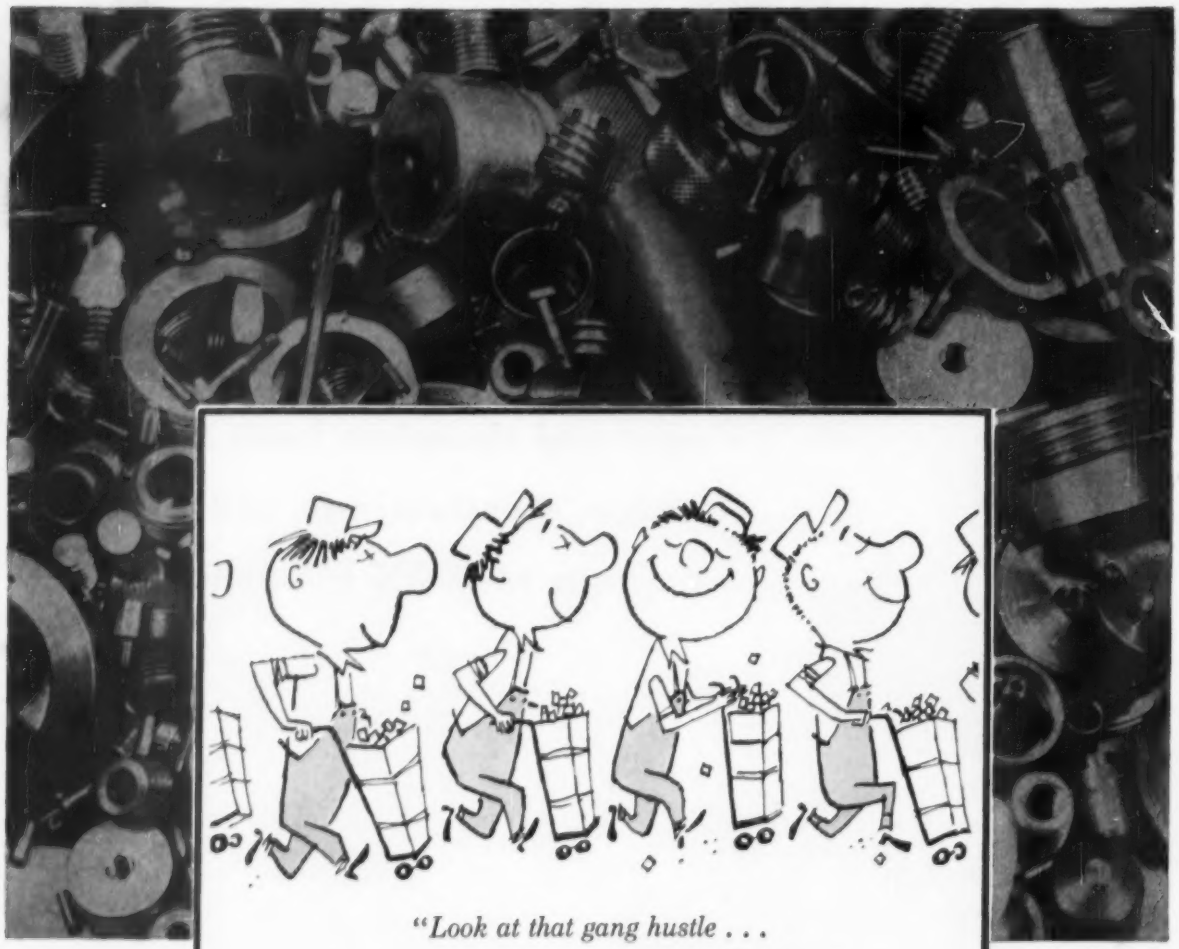
31 Years of Special Machine Tools with Automation



"Look at that gang hustle . . .
you can tell we're running on MX today."

You can confidently count on bigger output—more parts per hour—when you put USS Free-machining MX Steel to work.

By making it possible to run at cutting speeds up to 50% higher than normally used with regular Bessemer grades, MX has boosted production in hundreds of shops from 10 to 50%—an average of 40%. And with this easier machining steel, tools have lasted up to 200% longer.

USS Free-machining MX has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today . . . yet it costs no more than ordinary screw stock.

Based on the results obtained in producing more than a billion parts of many different kinds and under different conditions, we feel sure that MX will cut the cost of any part you now machine from ordinary screw stock. It does this in four ways.

By increasing the rate of production, *MX lowers the cost per part.* By prolonging tool life, *MX reduces down time.* By assuring better part finish, *MX often eliminates extra finishing operations.* By providing closer dimensional accuracy, *MX helps to minimize rejects.*

Available in both Bessemer and Open-Hearth grades, USS Free-machining MX is produced in all the popular screw stock sizes. It is sold in cold finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our district sales offices.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
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Longer tool life . . . bigger output . . . lower costs

—when you do the job with free-machining MX

USS

UNITED STATES STEEL

Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

TWO "FIRSTS" STRETCH AUTOMATIC TURRET LATHE CAPACITY

Octagonal Turret with JETracer Offers More Work Per Chucking

By taking advantage of two "firsts" in automatic turret lathe accessories, the Edward Valve Division of Rockwell Mfg. Co., East Chicago, Indiana, has increased production of 1½" steel Univalve bodies.

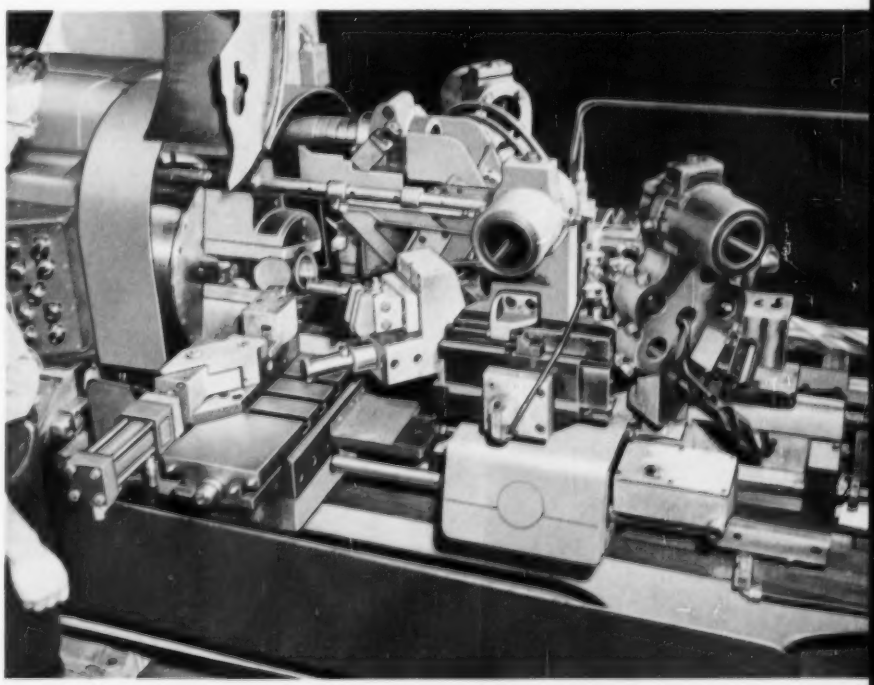
A new MASTERLINE 2F Fastermatic is used. Equipped with an 8-sided turret and a turret-mounted JETracer, a maximum number of surfaces are machined per chucking. Set-up is especially fast and easy. The Fastermatic's toggle switch setup control panel is used to preselect all important machine functions, including low spindle speeds for drilling, forming and threading and high speeds for other operations.

The workpieces are held in an 18" 2-jaw hydraulic operated chuck. Automatic positioning at the end of each cycle speeds loading and unloading. After the automatic cycle is started, hexagon turret tools drill, turn, face, form, relieve, chamfer, bore and thread, in addition to facing and chamfering performed from the two cross slides. The turret-mounted JETracer operates within the cycle to maintain high accuracy on the difficult internal machining operations.

The first operation is shown. The part is machined from the solid in 8.5 minutes floor-to-floor time. After the lot is completed, tools are adjusted on 4 hexagon turret stations and the part is completed, including generating the seat angle with the JETracer, in 2.8 minutes floor-to-floor.

Greater accuracy, finer finish and consistent quality are provided by completing maximum number of surfaces in a single chucking and using the JETracer.

Workpiece, showing multiple diameters accurately machined in two fast automatic operations.



Close-up of tooling. Note octagon turret mounting the JETracer unit, which is actuated by second overhead stop bar eliminating interference with overhead-piloted turret tools.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

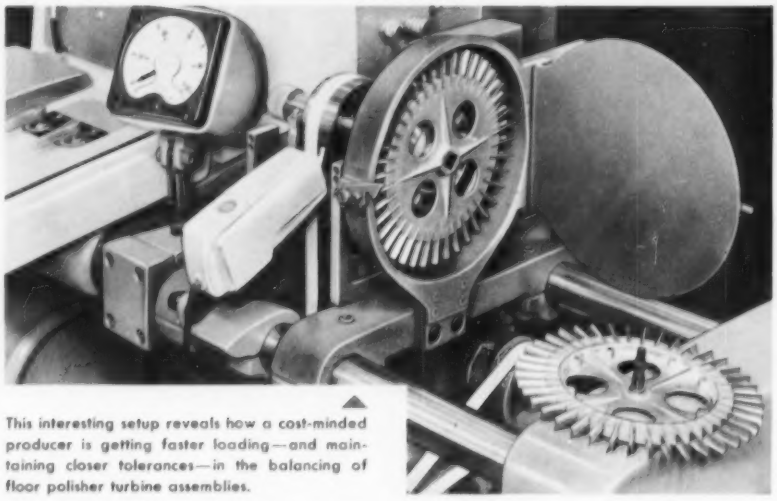
BALANCING IN OVERHANG SIMPLIFIES HANDLING

Gisholt 1S with Special Arbor Makes Impeller Balancing Precision, High-Speed Operation

With this arrangement, the producer is balancing floor polisher turbine assemblies outside the work supports eliminating the work of belt-shifting and arbor-handling.

The machine used is the Gisholt Type 1S balancer, equipped with a special arbor which is not removed from the work supports. A hinged shroud reduces air-turbulence and protects the operator. Because the part has large diameter compared to width, only single-plane force unbalance is measured.

The Direct Reading Amount Meter is calibrated to make one unit equal 1/32" drill depth of a 3/16" drill at the correction radius. The operator simply looks at the meter, marks the angle, removes the part and corrects it on a nearby drill press using a 1/32" depth scale to speed the operation.



This interesting setup reveals how a cost-minded producer is getting faster loading—and maintaining closer tolerances—in the balancing of floor polisher turbine assemblies.

One operator locates, measures and corrects 25 assemblies per hour with this setup. Balancing in the overhang drastically reduces workpiece handling while maintaining high accuracy.

250% PRODUCTION INCREASE WITH THIS SETUP

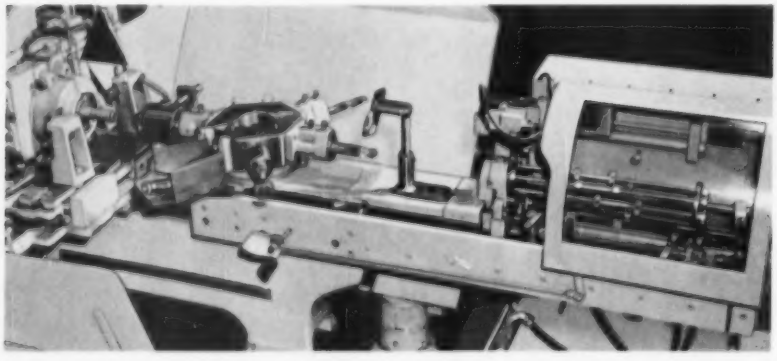
Hydraulic Drive Converts Hand-Operated Lathe to Fully Automatic Operation

You'll be impressed with how this manufacturer has accomplished full automation on small job-lot production runs. The workpieces are steel adjusting screws, produced from bar stock in a variety of sizes.

Here's how it's done on a screw 3 1/8" long with 1 11/16" diameter—automatically controlling all operations and machine functions with the Lynn Hydraulic Drive Unit mounted on the rear of the Gisholt Ram Type Turret Lathe. Fed pneumatically against a turret stop and chucked, the stock is start-drilled, then finish-bored with a large drill. The Hydraulic Drive automatically backs the drill out to clear the chips, then rapid traverses back to where it left off before dropping into feed to continue drilling. Spindle speed automatically decreases as tools on the front cross slide form the O.D.—drops into a lower speed as the O.D. is threaded—and into another low speed as radii are formed on the finished part and on the end of the bar stock. A tool on the rear cross slide cuts off the finished part, which drops into a basket mounted on the hexagon turret for easy removal by the operator.

Former f.t.f. time with the hand-operated machine on this job was 8.1 minutes—now cut to only 3.25 minutes floor-to-floor by the Lynn Hydraulic Drive, with no additional setup time required.

This setup increased production, eliminated human error, and provided automatic operation for existing equipment at the lowest possible cost per unit.



Hydraulic drive unit (right) and pneumatic bar feed provide complete automatic operation for hand-operated turret lathe. Note special cam plate on rear of turret ram to close die head as turret indexes.

Finished workpiece, completely machined from bar stock in one fast, automatic operation. Class 3 threads are no problem with the Lynn Hydraulic Drive arrangement.

GISHOLT

TIME-SAVING IDEAS

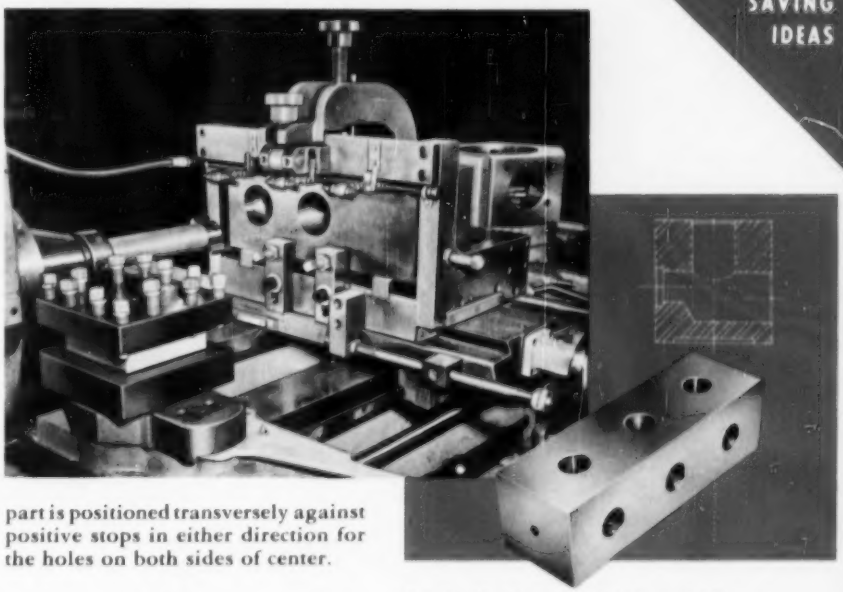
TWO MACHINES FOR THE PRICE OF ONE

Fixture Converts Standard Turret Lathe for Precision Boring Operations

Here's how Ajax Iron Works, Corry, Pa., saved the cost of a special purpose machine through smart tooling on a standard Gisholt 3L Saddle Type Turret Lathe.

The workpieces are tough steel cylinder blocks for Triplex Pressure Pumps used in oil well reclamation projects. Made in small lots in various sizes, their production could not justify a special purpose machine. Also important, the many other jobs to be performed, required a rugged saddle type turret lathe.

Ajax solved the problem with a special fixture to hold the workpiece during machining. This fixture is mounted on a bridge-type cross slide base, with a manually operated handwheel providing transverse movement. The base is attached to the hexagon turret to receive longitudinal movement. To begin machining, the block is located against a positive stop on one end and clamped on the other. For the remaining three faces, a centering plug is used in the center hole of the previously machined face for accurate location. The part is positioned transversely against positive stops in either direction for the holes on both sides of center.



Special fixture holds close tolerances easily, and when not in use is easily removed to use lathe for conventional machining operations on other parts.

Cylinder block is securely held in special fixture. Note tool mounted on spindle nose quick-change tool holder and adjustable transverse stops at lower right. All four faces are machined as per cross sectional drawing.

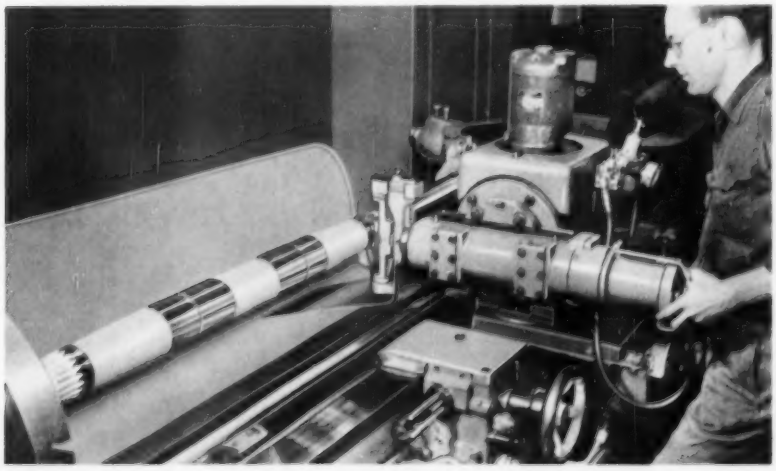
ATTACHMENT ON LATHE CUTS COSTS ON SHORT RUNS

No. 4 Superfinisher Provides Required Finish in Minimum Time, Saves Machine Investment

Here's how a cost-wise manufacturer is handling one-piece jobs on short runs not justifying the extra expense of a large machine.

The workpiece—a steel axle used on one of today's modern commercial aircraft—is of 50-53 Rockwell C hardness. To provide the fine finish and long wear life required for several surfaces, the manufacturer is Superfinishing the axles to a high degree with a No. 4 Superfinishing Attachment mounted on a turret lathe.

In addition to obtaining the 3-4 micro-inch surface finish desired, the part is also sized on this job. A slow spindle speed combines with a fast traverse and fast oscillation rate for the roughing operation, and a fast spindle speed is used with a slow oscillation and traverse rate to finish each bearing surface. By removing amorphous "smear" metal, the Gisholt Superfinishing process assures longer, safer wear-life on the axles' most critical areas.



Use of Superfinishing attachment utilizes existing machine, improves product performance and quality.

Close-up of operation, showing Gisholt No. 4 Attachment used to Superfinish 6 diameters on commercial aircraft axle.

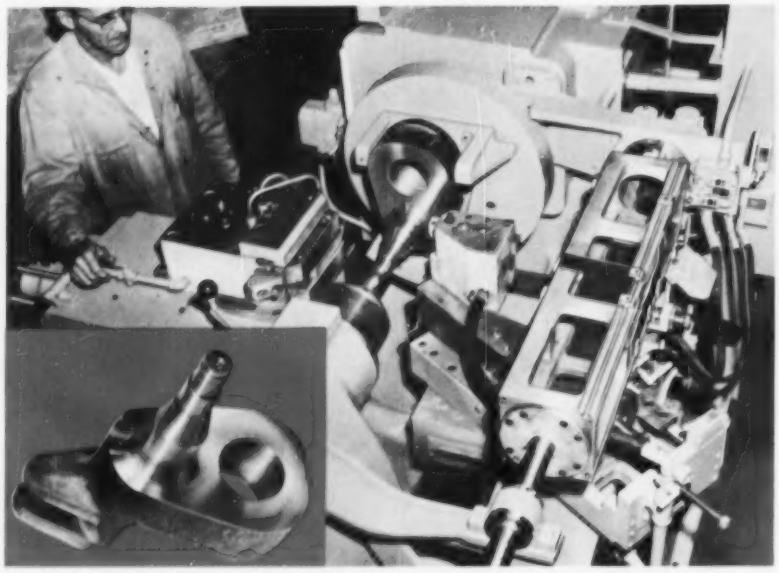
GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

WHIPS PROBLEM PART WITH RIGHT EQUIPMENT

Tough, Interrupted Cut and Contour Machining Easily Handled by No. 24 with Gisholt JETracer



Workpiece supported between centers using special fixture to locate and drive. Note JETracer on rear slide, with stylus at rear of cam roll. Different templates on each face are for different lengths of cut.

You'll like the way this producer is turning out steel tank idler arm forgings with the powerful No. 24 Automatic Production Lathe. Special equipment includes a JETracer on the rear independent slide, plus a 2-speed motor arrangement to provide correct machining speeds when facing and turning.

The part is held between centers, with a special face plate fixture locating the work and driving against the large O.D. radius. All cuts are made separately, with each slide performing a rough and finish pass. The front tool slide faces at 60 rpm and .015" feed (306 fpm), and has automatic tool relief. Two tools divide the length of cut to shorten machining time. A special step-over cam arrangement repositions the front carriage and its tools for the finish pass. The JETracer—controlling the rear slide which turns all diameters on the idler arm at 180 rpm and .015" feed (259 fpm)—uses a 4-position indexing cam roll permitting up to 4 automatic passes if needed. Floor-to-floor time on the 18" long, 5½" major radius part shown is just 21.1 minutes.

JETracer provides maximum accuracy with minimum operator effort; is easily set up for other workpiece sizes.

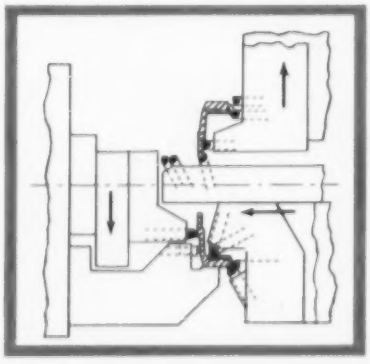
MACHINES ALUMINUM AND CAST IRON SIMULTANEOUSLY

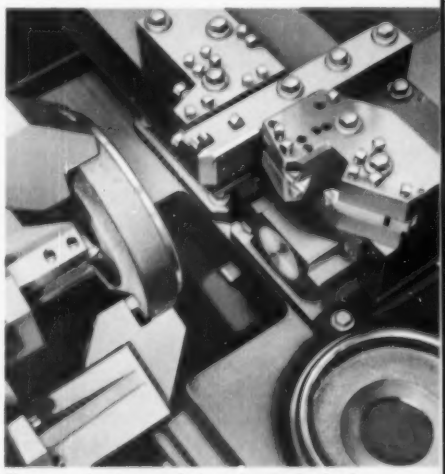
Completes Part in Single Chucking with Back-Facing Attachment on Simplimatic

Every second pays off in this job. In one chucking on a Simplimatic Automatic Lathe, the manufacturer is handling brake drums 11¼" in diameter and 2½" deep—machining the aluminum shell and cast iron braking surface insert at the same time and getting a fine finish on both.

The conventional air chuck could not be used, because the spindle bore had to be cleared for mounting a back-facing attachment. A power chuck wrench operates the scroll chuck, gripping the work on the O.D., locating against the back of the part. The back-facing attachment does the back side of the web, while tools on the two front slides handle all surfaces indicated on the layout.

Eleven tools machine 10 surfaces in just 2.4 minutes f.t.f. time, with minor adjustments handling either front or rear brake drums.





Close-up showing workpiece in chuck, back-facing attachment at left center and slide tooling. Note rigid support for all tools.

9-1056
667

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

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SAFEST SLINGS MADE. ACCO cable laid slings, like all of the other slings in ACCO's complete selection, are registered—incorporate extra safeguards, which make them the safest slings made.

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Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then, and only then, does it receive the coveted registration certificate and tag.

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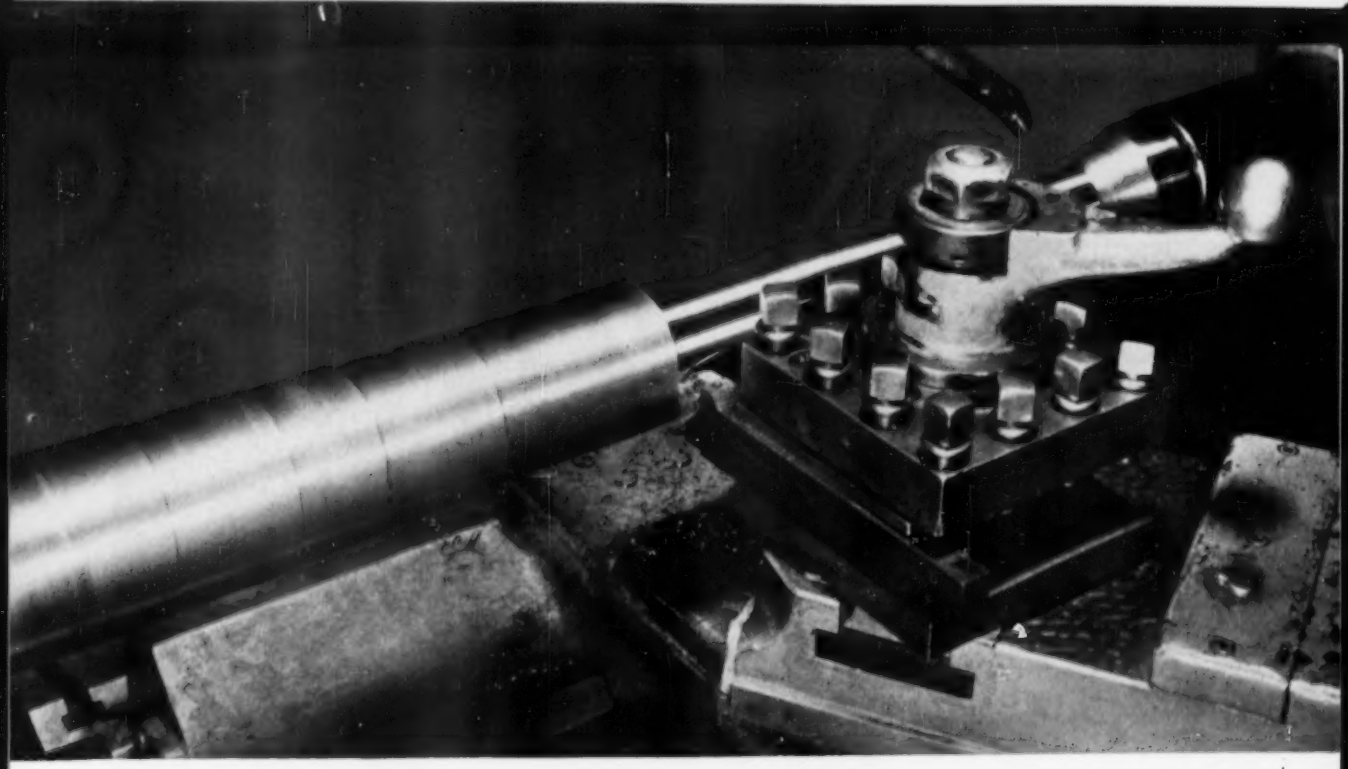
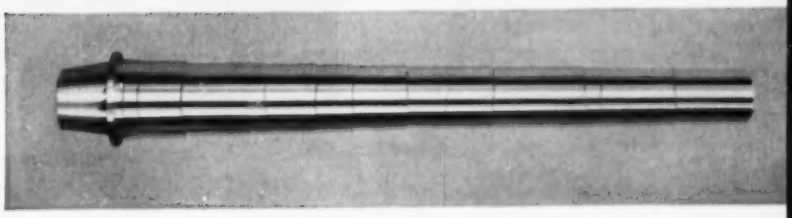


Carboloy Cemented Oxide finishes 31-inch lathe spindles in 2.8 minutes at R. K. LeBlond Machine Tool Co. Carbide tool used previously required 6 minutes. With the Cemented Oxide tool, the 12-step cut is made at 715 fpm – more than double the speed with carbide. Work finish is improved, and machine output is increased 45% per grind.



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FINISH STEEL WITH CARBOLOY CEMENTED OXIDE; GET FINER FINISHES AT HIGHER MACHINE SPEED

With new Carboloy® Cemented Oxide, you can finish steel faster than ever before possible. Specially developed for machining at speeds beyond the range of carbides, Cemented Oxide produces superior surface finishes, while reducing your machining costs.

Cuts faster, wears longer

Field and laboratory tests show Carboloy Cemented Oxide can be used effectively at speeds from 300 to 7500 fpm, on steels up to 300 Brinell. It cuts cleanly, resists edge wear and cratering at surface speeds which would quickly ruin other cutting materials.

Carboloy Cemented Oxide brings you two major advantages: It lets you cut faster – and therefore more efficiently – with your present equipment; it reduces the time required to complete a job. And, its unusual wear-resistance at these high speeds means less downtime for tool changes, lower tool and grinding costs.

Resists chipping, stays cool

Cemented Oxide is an entirely new kind of cutting material. It is harder than carbide, stronger and more resistant to chipping than typical ceramics. Even at extremely high operating speeds, the tip stays so cool it can be touched immediately after the cut.

With Cemented Oxide Grade 0-30 and the three Carboloy extra-performance carbide grades, you now have a specialized cutting material available for every steel-cutting job from roughing to super high-speed finishing. Limited quantities of Cemented Oxide Grade 0-30 are ready for evaluation on your finishing jobs. For information or technical bulletin, send the coupon on page 4 of this advertisement.

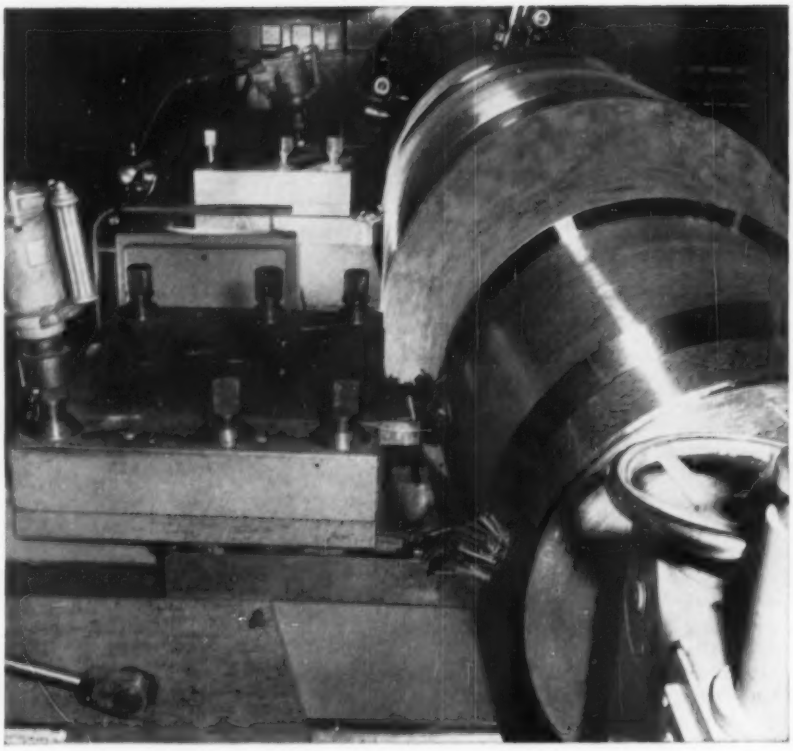
CARBOLOY
CEMENTED OXIDE

GRADE 370

EXTRA-PERFORMANCE CARBIDE FOR HEAVY-DUTY ROUGHING

Grade 370 is built to take heavier roughing cuts at higher speeds and feeds . . . yet outlast conventional carbides. Hundreds of in-plant tests have proved Grade 370 will remove more metal per minute – and take more regrinds – than any other grade.

For example, on huge steel backup rolls like the 31-ton roll at right, a single Grade 370 insert has removed 24,000 cubic inches in 2½ hours . . . without regrinding. Cutting through rough scale and hard seams, Carboloy Grade 370 tools will finish this job in 16½ hours.



For every job from roughing to finishing . . .

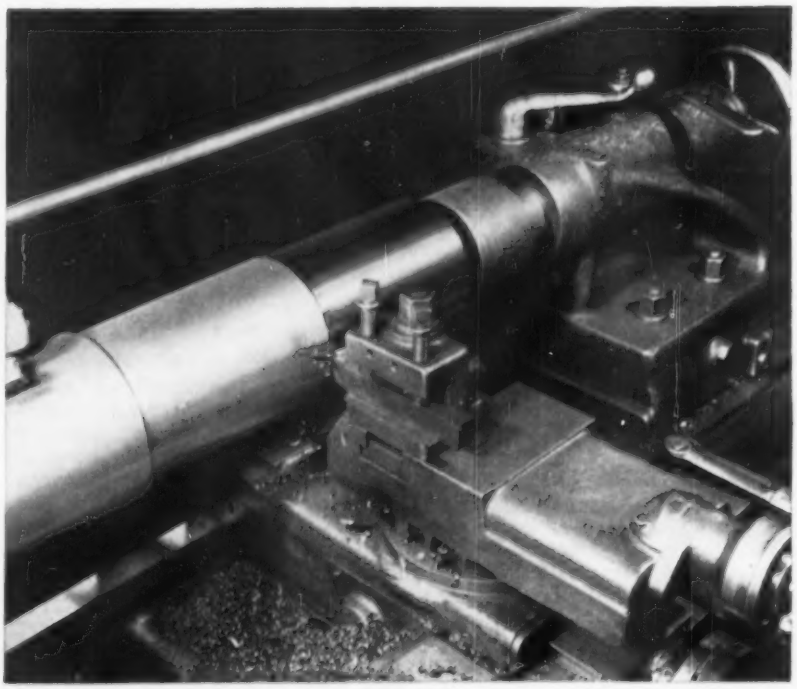
CUT STEEL FASTER, LOWER TOOL COSTS WITH

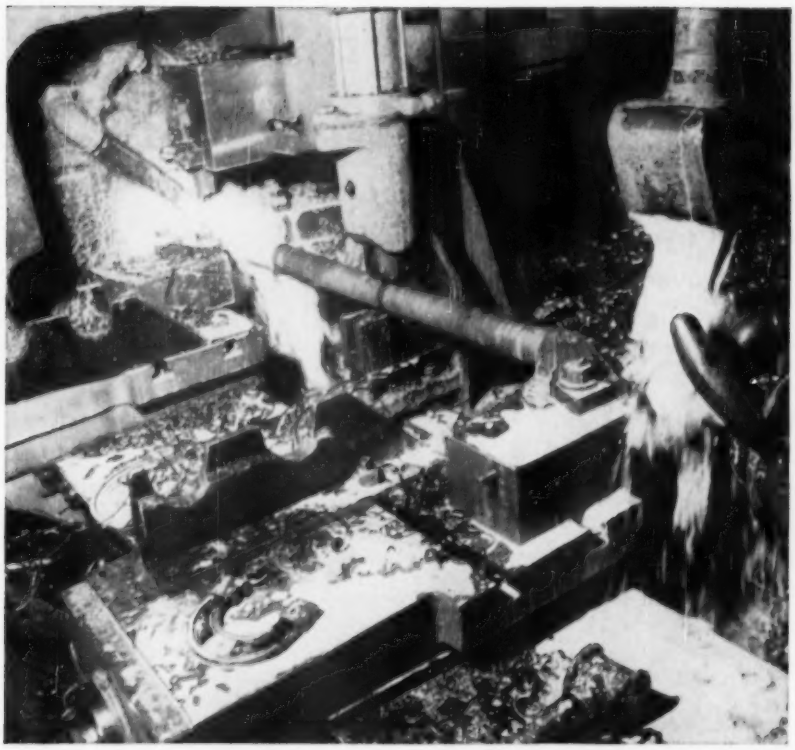
GRADE 330

EXTRA-PERFORMANCE CARBIDE FOR FINISHING AND BORING

New Carboloy Grade 330 is twice as strong as conventional steel-finishing grades. Its entirely new composition makes 330 easier to braze, yet more resistant to chipping. Unlike other finishing grades, Grade 330 is so tough it can be ground on automatic grinders without cracking.

Grade 330 can take speeds 10% higher than other carbides, without loss of tool life. When compared at a series of speeds ranging from 600 to 1900 fpm, Grade 330 outlasted other grades by 20%-35%. (Picture at right shows surface finish obtained on S.A.E. 1045 steel at 800 FPM.)





GRADE 350

EXTRA-PERFORMANCE CARBIDE FOR MEDIUM-DUTY MACHINING

Grade 350 was specially developed to increase your machines' efficiency in the light roughing and general finishing range. Built-in structural rigidity enables Grade 350 to withstand steel-cutting conditions which quickly cause tip deformation in ordinary carbides. Its extra strength gives you more production per grind, more grinds per tool.

For example, in machining the AISI 4150 truck axle forging at right, Grade 350 boosted production 33%. In addition, Grade 350 eliminated chipping and flaking encountered with other carbides.

CARBOLOY EXTRA-PERFORMANCE CARBIDES

- **Take heavier, deeper cuts with Grades 330, 350, 370**
- **Get increased production from machines and manpower**

Announcement of new Grade 330 means you now have a choice of *three* Carboloy extra-performance steel-cutting carbides.

New Grade 330 takes up on finishing and boring jobs where medium-duty Grade 350 leaves off. And together with heavy-duty Grade 370, these carbides offer you faster cutting at lower cost over the complete steel-cutting range from roughing to finishing.

Outperform conventional carbides

Service-proved on thousands of applications like the ones above, these grades consistently outperform conventional carbides. Even at higher speeds and feeds, they take heavier, deeper cuts . . . yet outwear other grades.

Their superior strength means more production per hour, greater output per machine. Their resistance to wear means less downtime, fewer wasted man-hours for tool changes, and lower tool costs.

Complete line stocked locally

All three of these extra-performance carbides are stocked locally by your Authorized Carboloy Distributor. They are available in a complete line of standard tools and blanks, as well as inserts for your toolholders.

Try these extra-performance carbides in your plant . . . and see why there is no such thing as an "equivalent grade" for Carboloy 330, 350, and 370. For more information, see your Carboloy Distributor, or mail the coupon on page 4 of this advertisement.

CARBOLOY
CEMENTED CARBIDES

CUT MACHINING COSTS, SAVE SETUP TIME WITH CARBOLOY MACHINABILITY COMPUTER

- ▶ **Determine most efficient cutting conditions in seconds**
- ▶ **Eliminate wasteful tryout runs, save valuable stock**
- ▶ **Get closer control over inventories and production schedules**

How the Machinability Computer is helping Scully-Jones and Co.

Original operating standard for machining expanding shells called for 244 minutes per part. But by calculating the optimum combination of speeds, feeds, and other data on the Computer, the company saved 77.8 minutes per part. Machining time was cut 32% . . . 17 machining hours were saved on a 13-piece run. Scully-Jones used the Computer to determine correct setups for both HSS and carbide tools—on turning, facing, drilling, and boring jobs.

Scully-Jones and Co., Chicago, is just one of hundreds of plants now getting greater production from their machines by using the Carboloy Machinability Computer.

Machining data are fed into the Computer . . . and in seconds, optimum speeds, feeds, horsepower ratings, or any of 16 other operating variables are accurately figured for the machinist.

On the job above, for example, the Computer showed how to cut machining time 32% on a 13-piece run . . . saving 17 machining hours and eliminating wasteful tryout runs.

Benefits extend plant-wide

On other jobs throughout the plant, the Computer establishes new operating standards, corrects and verifies existing ones . . . in a fraction of the time previously required.

In addition, the Computer simplifies inventory problems by predicting rate of tool wear. It aids grinding rooms plan work loads; helps management coordinate production schedules. The Computer is a versatile engineering tool for any sized plant.

Ask for demonstration

Price of the Carboloy Machinability Computer is $495, f.o.b. factory, Detroit. It is battery-operated, portable, and rugged; can be used by anyone with machining experience after a short familiarization period.

For more information on how the Computer can help your plant increase production and reduce manpower costs, mail the coupon below. If you wish, we will gladly arrange a demonstration in your plant.

CARBOLOY
MACHINABILITY COMPUTER

Metallurgical Products Department
General Electric Company
11149 E. 8 Mile Blvd., Detroit 32, Mich.

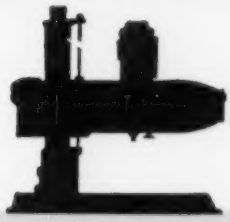
Send me information on the following products:

- ☐ Carboloy Cemented Oxide Grade 0-30
- ☐ Steel-Cutting Grades 330, 350, and 370
- ☐ Carboloy Machinability Computer
- ☐ Have a representative make an appointment to demonstrate the Computer

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Carboloy is a trademark of General Electric Company

AT THE METAL SHOW: **"New Worlds in Metalcutting" with Carboloy Cemented Oxide and Carboloy carbide grades 330, 350, and 370. *Booth No. 2124.***



NEW HEAD CONTROLS make Fosmatic Radial easier than ever to run!

Numerical Dials select feeds and speeds quickly, easily, with minimum possibility of error. Select even while drill is running, to save time on next operation.

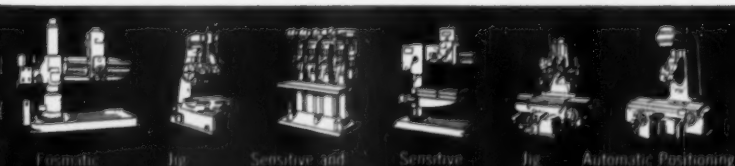
Single Control Lever starts, stops, reverses and shifts to feed and speed set on numerical dials.

Push Buttons on quick return levers engage feed. Feed is disengaged automatically by depth control or by pushing either button again. Magnetic clutch needs no adjustment.

Head Traverse Lever also elevates arm. Variable speed hydraulic motors drive both traverse screw and elevating nut. Clutches eliminated.

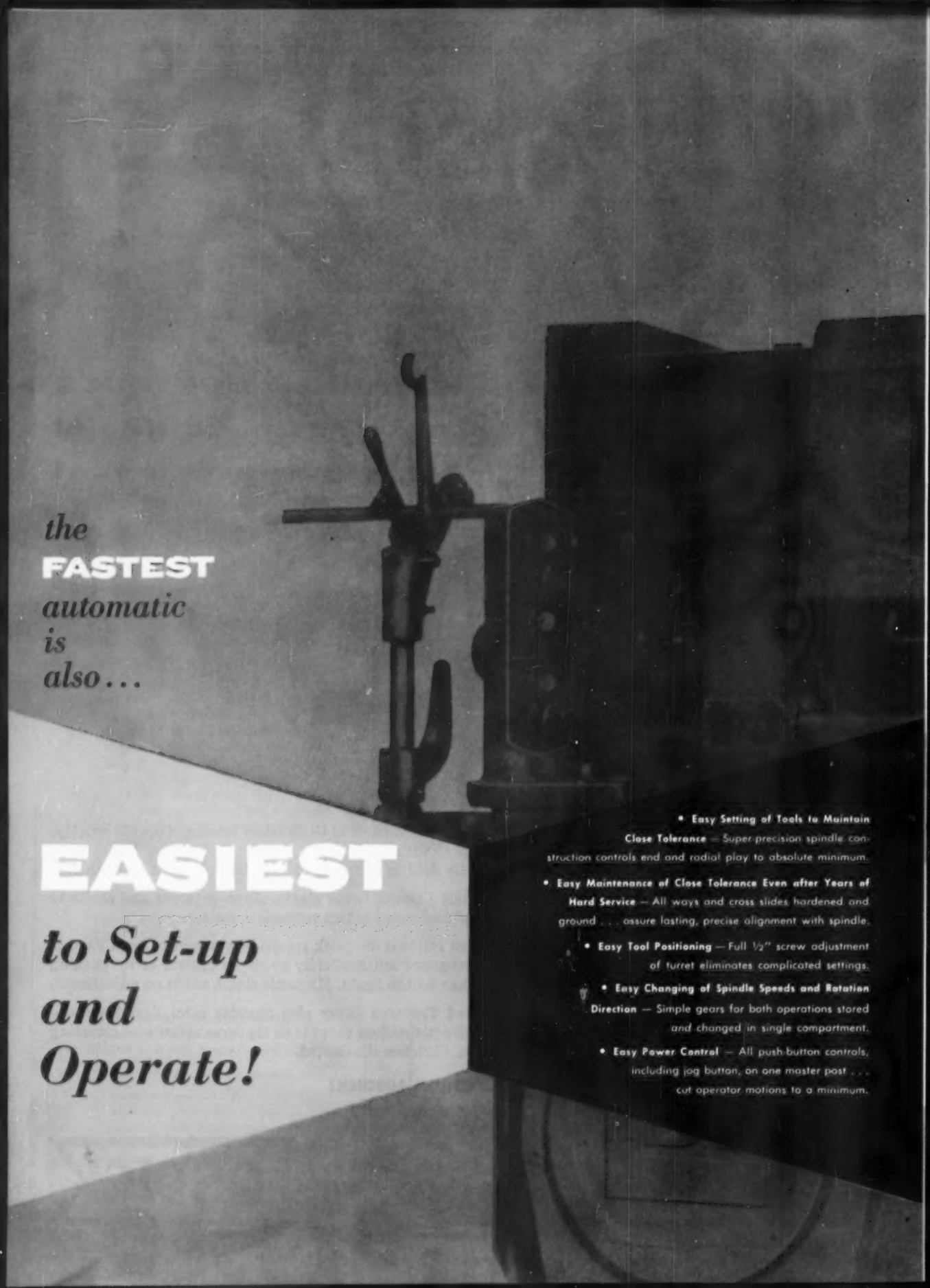
Other Fosmatic features include: 36 spindle speeds, 18 feeds, 4' to 8' arms, 13" to 19" columns, Boring Type Spindle, Safety Interlocks, Variable-Tension Counterbalance for Spindle, and optional Milling Feed.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK


the
FASTEST
automatic
is
also...
EASIEST
to Set-up
and
Operate!
• Easy Setting of Tools to Maintain Close Tolerance — Super-precision spindle construction controls end and radial play to absolute minimum.
• Easy Maintenance of Close Tolerance Even after Years of Hard Service — All ways and cross slides hardened and ground . . . assure lasting, precise alignment with spindle.
• Easy Tool Positioning — Full ½" screw adjustment of turret eliminates complicated settings.
• Easy Changing of Spindle Speeds and Rotation Direction — Simple gears for both operations stored and changed in single compartment.
• Easy Power Control — All push-button controls, including jog button, on one master post . . . cut operator motions to a minimum.

Brown & Sharpe
No. 00 Automatic
Screw Machine

That's right! The fastest automatic on the market also holds the record for ease of set-up and operation! In fact, the Brown & Sharpe No. 00 Automatic Screw Machine provides a unique combination of high speed, easy operation, and low maintenance that steps up overall efficiency as much as 33⅓%! Push-button controlled, modern in every detail, it's the truly advanced automatic for turning, forming, one-chip finishing to 0.0005". Only a few of its time-saving features are listed on these pages. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

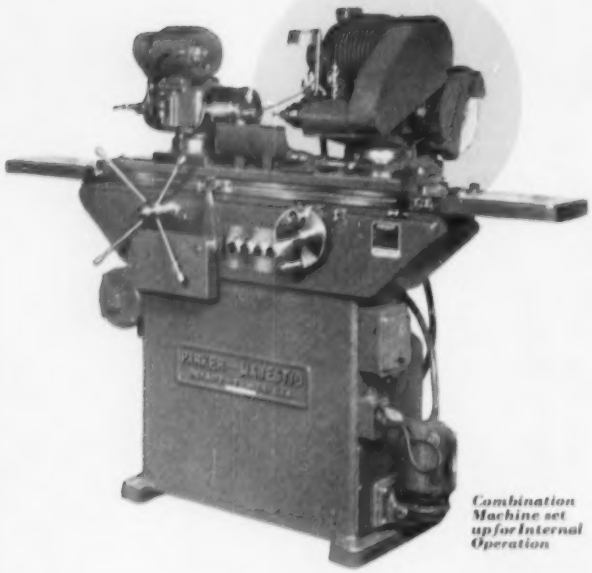
Ask about Our Pay-as-You-Depreciate Machine Tool Plan

Brown & Sharpe MBS

PARKER - MAJESTIC pm PRECISION MACHINES

NOW

A COMBINATION INTERNAL/EXTERNAL GRINDER



Combination Machine set up for Internal Operation

PARKER-MAJESTIC *presents the well known Internal and External Grinder shown here as a combination unit.*

- **One spindle mounting bracket performs both operations.**
- **Quick changeover—Loosen only four nuts and swivel bracket 180° to bring spindle into operating position.**
- **12″ swing over table.**
- **Horsepower rating maintained in new totally enclosed motor design; drive pulleys mounted on either end of motor.**
- **Internal spindle driven by flat belt in conjunction with spring loaded idler assembly of new design.**
- **External spindle driven by timing belt requiring little belt tension.**
- **Operator protected by well designed guards.**

Combination Machine set up for External Operation

PARKER-MAJESTIC, INC.

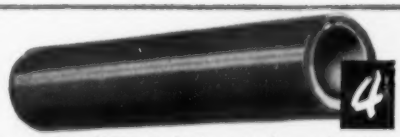
147 Joseph Campau • Detroit 7, Michigan

7 WAYS to SAVE MONEY with TOCCO* Induction Hardening

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½c saved on every piece — $4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.

Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of $375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from $1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.



Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from $5.45 to $3.25 per hundred parts—a savings of 2c per pin, $26.40 per production hour.

Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.

7 Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

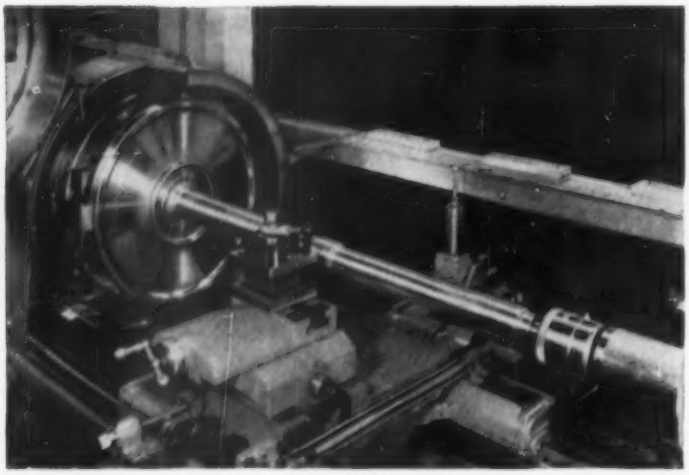
THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. B-9, Cleveland 1, Ohio
Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____



now

handle jobs
impossible on a
conventional
tracer lathe . . .

with the **LODGE & SHIPLEY**

DUAL TRACER

Lathe and All-Hydraulic 360° Control

DUAL TRACER Lathe in plant of famous auto manufacturer turns all shaft diameters on a hub assembly for a turbine rotor. Machining time on this 54" x 4" diameter part is only 22.5 minutes. Also used to face both sides of the hub portion of this part.

On many types of work, conventional tracer lathes are limited in their ability to handle complex jobs. The Lodge & Shipley DUAL TRACER Lathe is a significant advance. It is designed to speed and simplify the duplication of complex curves on a lathe which can also be instantly changed over to standard lathe operation.

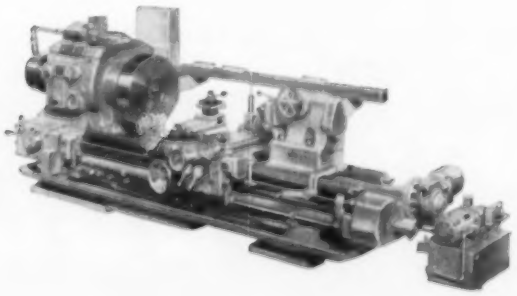
The most important application of the DUAL TRACER is in the machining of complex contours on the periphery, bore or face of a component.

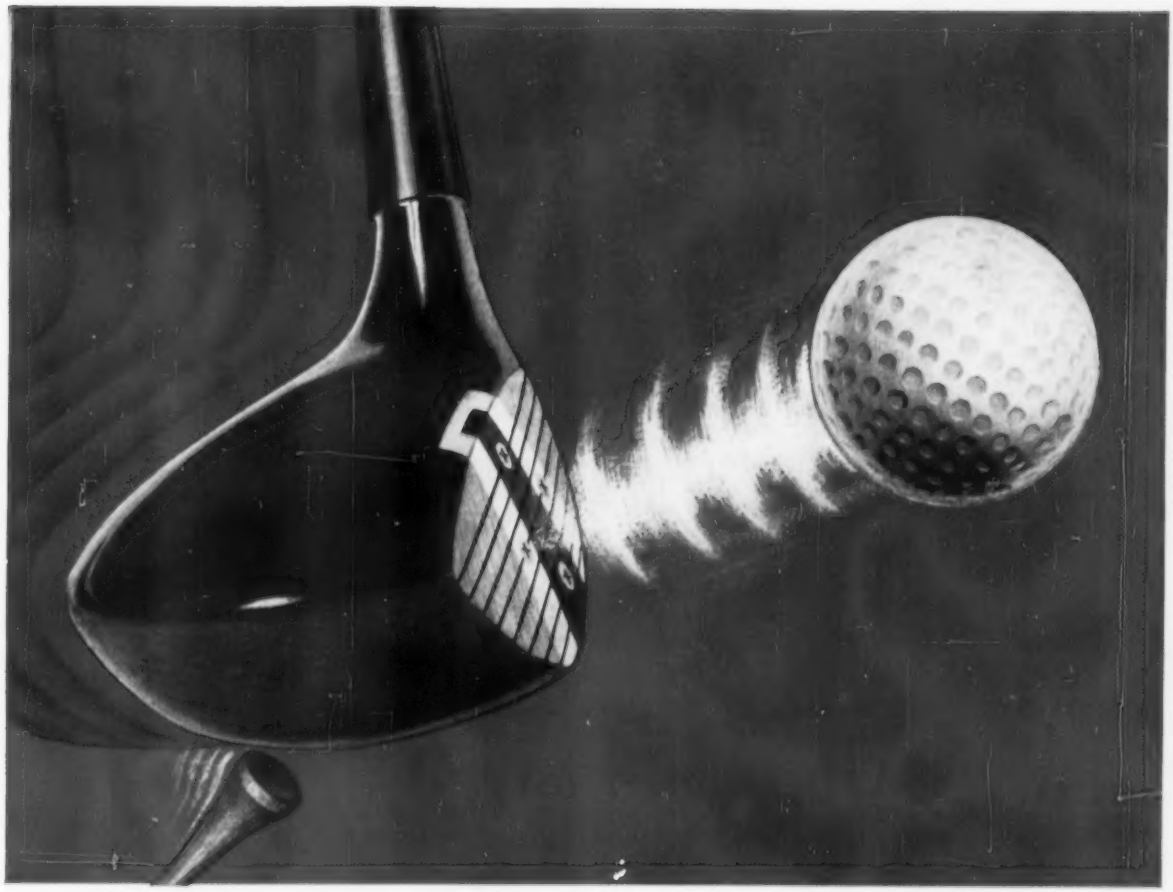
Reduced to its basic elements, the DUAL TRACER Lathe consists of two (or dual) hydraulic motors controlled by the tracing stylus. One motor controls the rotation of the cross feed screw and hence the "in and out" movement of the cutting tool or tools. The other motor controls the rotation of the lead screw and hence the movement of the carriage along the ways.

Chances are the DUAL TRACER can do your job faster and more economically. Consult our sales engineering department. *For details, write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25 Ohio.*

Built by
LODGE & SHIPLEY

- **LATHES**
- **HYDRAULIC PRESSES**
- **PRESS BRAKES**
- **SQUARING SHEARS**
- **FLOTURN MACHINES**





"Finish first in your league"

...with J&L COLD FINISHED LEADED STEELS

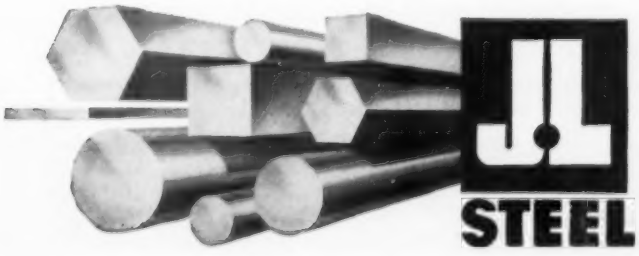
These modern, superior J&L Leaded free-machining cold finished steels are meeting with outstanding acceptance in machine shops everywhere. They are a star member of the complete line of premium quality, free-cutting cold finished bar steels produced over the years by J&L specialists. Thus, we can recommend the right type to help solve your particular machining problems.

Available in *both Bessemer and Open Hearth grades*, J&L Leaded steels offer:

- **SUPERB MACHINABILITY**—because they enable you to use optimum cutting speeds, to secure longer tool life and to produce superior surface finishes.
- **GREATER UNIFORMITY**—because they are completely J&L-produced from the basic raw materials to guarantee optimum uniformity which is so necessary for modern industry's high-speed machining operations.
- **HIGHEST QUALITY**—because they must meet the rigid quality standards developed by J&L through years of leadership in the development and production of free-cutting steels.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

Another PUTNAM *first!*

STANDARD END MILLS FOR ALUMINUM

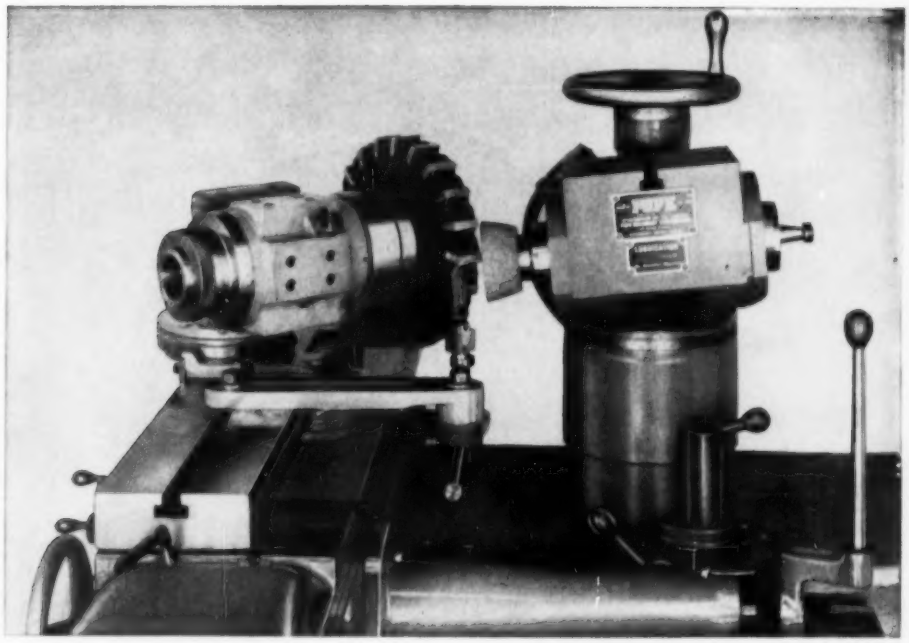
Now! **You can select a standard Putnam Hi-Speed end mill especially designed for machining aluminum and aluminum alloys.**

Putnam again leads the field by making available, from stock and at standard prices, end mills for machining aluminum. These tools have been developed through years of research and experience on aluminum applications. Correct design, flutes polished all over, finest materials, and uniformity insure maximum chip removal, longer tool life, better finishes, free cutting and best all around performance.

End Mills for aluminum are offered in a range of diameters from ¼" to 2" in the three popular flute lengths. Other diameters and lengths can be furnished as required—prices on application.

Your local Putnam distributor carries over 1400 standard types and sizes of Putnam end mills—contact him for the best in service and quality end mills.

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN



COVEL NO. 12A . . . right on both counts

Send for new Bulletin 125 which shows how to grind tools with the No. 12A tilting head. Mail the handy coupon.

Right for PRODUCTIVITY. . .

It's important to you because tool sharpening time is production time—as much so as the production time of a milling, drilling or boring machine. On a Covel No. 12A, for example, grinding the periphery and chamfer of a 6-inch 8-tooth face milling cutter, including the two setups, required only 39 minutes to complete.

Right for ACCURACY. . .

Maintaining the efficiency and the quality of work produced by a machine tool depends on accurately sharpened tools. On cutters, reamers, slab mills and other tools sharpened on Covel No. 12A, easily established clearance angles are accurately maintained. Runout is held to a minimum, only .0005 on a 10-inch cutter. Quality finishes as low as 4 microinches also are obtained. You get longer use of tools between sharpenings, lower overall production costs.

Covel No. 12A features render older machines obsolete by comparison. No. 12A's Pope tilting and swiveling head saves time and money on every tool grinding job. The head has a motorized 1 h.p. spindle and is easy to adjust. Degrees of clearance are easy to establish and can be read directly in degrees from a scale on the head.

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. AM -206

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

☐ *Send Bulletin 125*

Name _____ Title _____

Company _____

Street _____

City _____ Zone _____ State _____

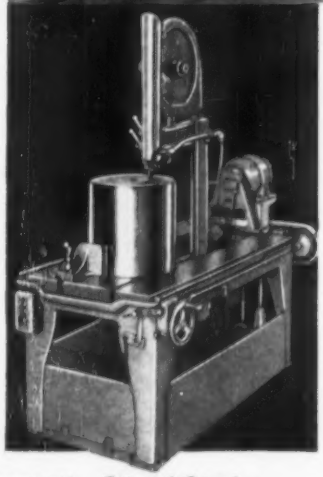
MARVEL NO. 8 BAND SAW makes a tough job EASY...

FLOOR TO FLOOR IN 5 HOURS... no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.

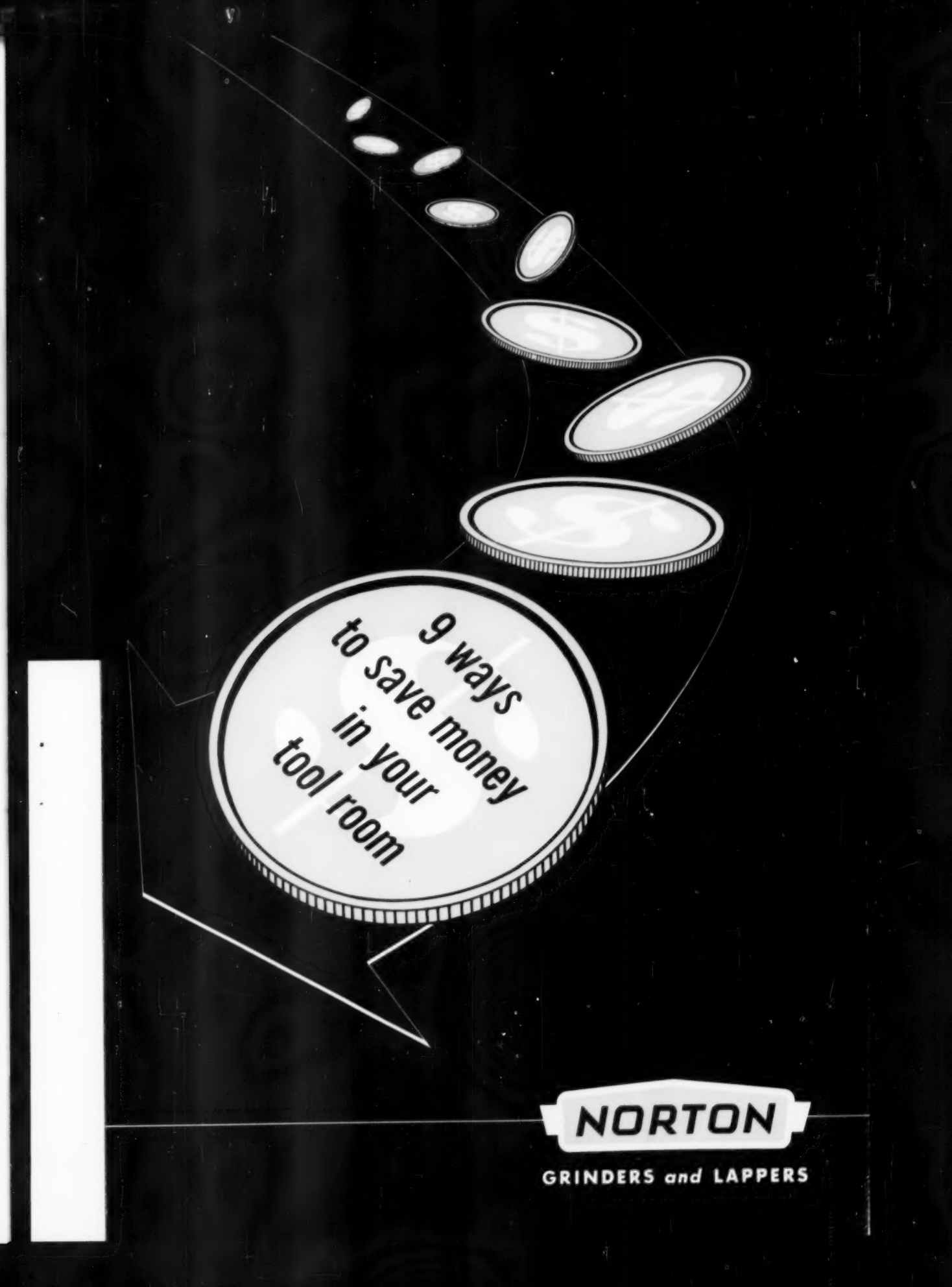
Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.



ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. · CHICAGO 39, ILL.

Metal Cutting MARVEL SAWS
Better Machines-Better Blades

S-1302



NORTON

GRINDERS and LAPPERS

9 money-saving ways to start a tool conservation prog

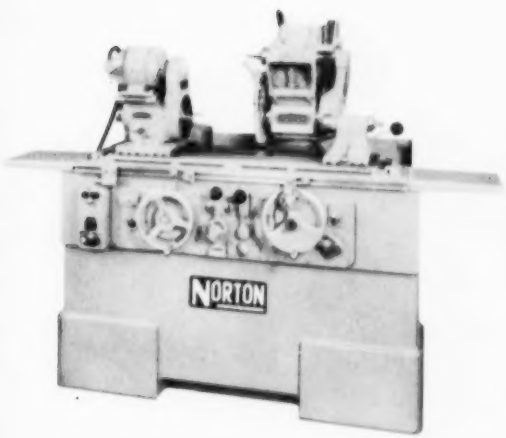
NO. 20 CUTTER AND TOOL GRINDER. Fastest, most versatile machine of its type ever built. Easier to set up, operate and maintain, it handles many tool room jobs quickly and economically. Outstanding features are its tilting wheel head and dual front and rear controls. Wheel head can be tilted up to 15° above or below horizontal and swiveled through 360°. This eliminates time-consuming calculations and setup when grinding taper reamers, step counterbores, form tools, milling cutters and other ordinarily troublesome jobs. Many other advanced features add up to economical performance. Catalog No. 189 applies.

NO. 2 BURA-WAY® TOOL GRINDER. Provides the most accurate grinding of convex single point and form tools because it generates, reproduces and maintains relief angles constant in the direction of the feed. Uses master templates or cams generated from the master tools to provide exact duplications. Generous proportions throughout and rugged wheel spindle are among features assuring highest quality of finish for maximum tool performance. Helps extend the life of carbide-tipped and other tools considerably. Catalog No. 220 gives further data.

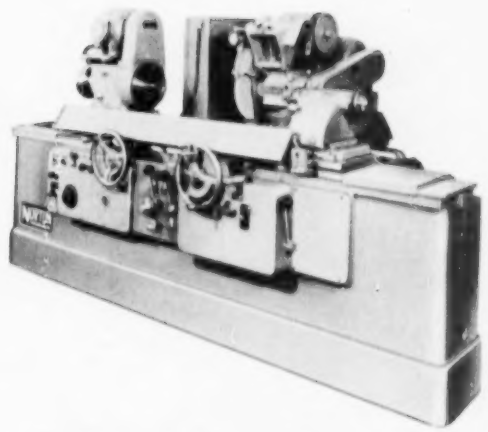
NO. 2 TOOL AND CUTTER GRINDER. Designed for a wide range of tool room jobs. Accurate and dependable in operation, inexpensive and easy to maintain. Its smooth, hydraulic table traverse is ideal for wet or dry cylindrical operations, internal jobs, or for grinding long reamers and cutters uniformly and easily. Sturdy, two-speed hand traversing mechanism also included. Other features include its cartridge-type wheel spindle with generously proportioned end thrust, long, wide saddle ways, conveniently located controls. Accessory equipment permits arrangement for a wide range of universal grinding. Write for Catalog No. 858.

a real

gram

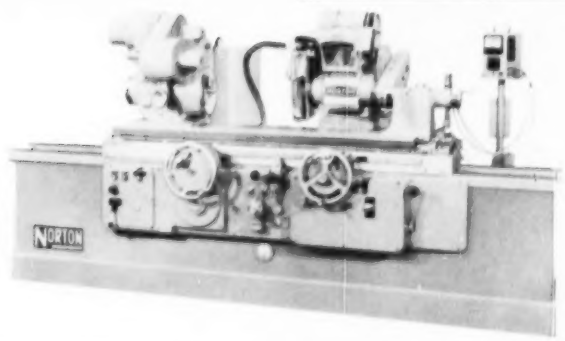


10" UNIVERSAL GRINDER. A small universal machine that gives you big profit margins on many different grinding jobs — external, internal, face or angular wheel-feed — from rough cuts to finest precision finishing. Interchangeable head and footstock permit simplified setups for shoulder or spacer jobs, especially on angular grinds. Permanent chuck mounting and D1-3" camlock nose on one end of the headstock spindle make chucking setups easier. Headstock swivels 180° to change from dead center to chucking work. Available in 20" and 24" work lengths. Write for Catalog No. 170.

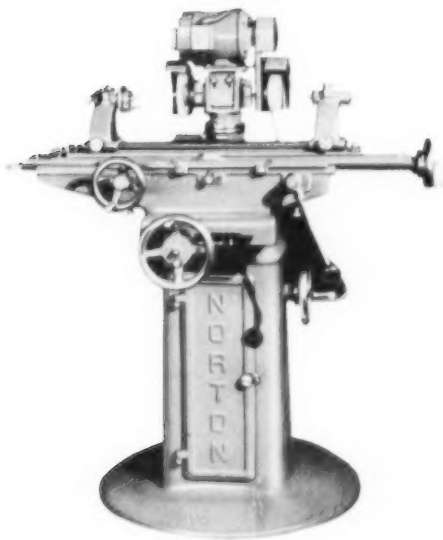


12" TYPE U-4 UNIVERSAL GRINDER. Featuring fast grinding action and quick, easy setup for external, internal, face or angular wheel-feed jobs. Provides an infinite number of speeds from 40 to 400 rpm at the turn of a dial. Other advantages include permanent chuck mounting; compound wheel slide that enables settings at any angle for both wheel and feed, independently; internal grinding spindle hinged to front of wheel slide, for quick change-over to or from internal grinding; greater shaft-grinding capacity, due to hollow spindle in headstock. Available in 36" and 48" work lengths. Catalog No. 231 applies.

NORTON SWIVALIGN† DUAL ELECTRIC INDICATOR — shown here on a 14" Type U-4 Universal — eliminates cut and try in establishing swivel table alignment. Available for use on Norton Universal and Cylindrical grinders.



14" and 18" TYPE U-4 UNIVERSAL GRINDERS. With these new machines Norton offers a complete, modern line of universal grinders, covering the broadest range of usefulness. To the famous Type U-4 features, the 14" and 18" grinders add new advancements. Adequate power over a wide work speed range from AC source. Steel-tape-type base way guards require no extra floor space. Wheel spindle enclosed by bronze bearings, which support over 50% of spindle body. Footstock spindle remains retracted for loading. Made in 36", 48" and 72" work lengths. Catalog No. 819 gives further details.



NO. 1 TOOL AND CUTTER GRINDER. Supplied in arrangements varying from a plain machine for sharpening cutters and reamers supported on centers only, to a universal machine for cutter, surface, cylindrical and internal grinding. Especially valuable for circular form tool grinding because of its micrometrical feed screw for traversing work table. Other important features are quick and easy setups for a wide variety of work, speed and accuracy of grinding, and convenient operation by dual controls in front or rear, left or right. Catalog No. 1034 applies.

To Economize, Modernize with **NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

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2 MORE MONEY SAVERS ON BACK COVER

What is it costing you not to use Norton tool grinders?

Perhaps the cost of new grinding machines has delayed your plans for modernizing your tool room operations.

But have you given due consideration to the cost of *not* modernizing?

Look at it this way. You'll agree that an effective tool conservation program pays handsome dividends. It pays off in tools that perform better, last longer and produce better products — tools that reduce the time, the costs and the headaches of production.

The first essential of any such program is efficient grinding equipment. No matter how well managed or how well appointed your tool room may be in other respects, no matter how skillful or conscientious your employees — if your grinding machines are not up to par you're fighting against heavy odds.

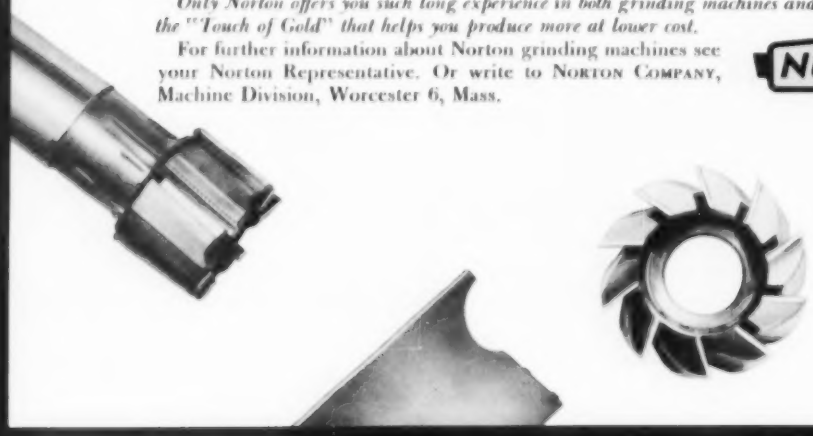
You're fighting against alert competition that is using modern, money-saving grinders like the Norton machines shown in this folder. That is why your tool conservation plans, your production, your place in a competitive field all call for the most efficient, most economical tool grinding you can get.

Right there is where the cost of *not* using Norton grinding machines enters into your production picture, because:

Only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost.

For further information about Norton grinding machines see your Norton Representative. Or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

NORTON



NORTON

GRINDERS *and* LAPPERS

These Two Surface Grinders

handle a wide variety of tool room operations and are fast, economical and accurate

8" x 24" HYDRAULIC SURFACE GRINDER. Produces plane surfaces accurately and economically, in operations ranging from heavy stock removal to meeting close tolerances. Two table traversing arrangements accommodate a wide range of jobs. Table can be operated up to 70 fpm by hydraulic power, or moved by hand for special grinding work. Operation is smooth and easy, controls are conveniently placed, maintenance points are quickly accessible. Available extras include wet grinding attachment, individual dust exhaust, magnetic chucks. Catalog No. 190 applies.

6" x 18" HYDRAULIC SURFACE GRINDER. Besides providing quick setups for production runs, it is equally useful for grinding a wide variety of small units in tool room work. Wide span horizontal ways and long wheel head guide ways assure accurate cross traverse and wheel head motions. These advantages combine with fast table traverse to produce exceptional grinding efficiency and economy. Convenient controls and easy accessibility keep operating and maintenance time low. Write for Catalog No. 954.

Pay for Norton machines while they build your profits

If the factor of capital investment is holding up your plans for replacing obsolete grinding or lapping equipment with new machines, investigate the Norton Machine Lease Program — three tested plans that enable you to modernize while conserving your capital. Or look into the Purchase Financing Plan, under which you may take up to five years to pay for income-producing equipment. Many Norton machines are available under these arrangements. For details, see your Norton Representative or write direct.

NORTON

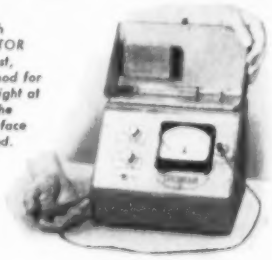
Printed U.S.A.

Undetected Machining Costs Can Lie Right on the Surface

Walking through your plant, it would be hard to see the needless costs hidden in undermachining or overmachining. These unnecessary costs can only be computed after parts are rejected by the inspection department and returned for further work . . . *or accepted with a costlier finish than required!*

Economy in surface finishing depends on machining to exact specifications. Whenever a surface is machined more or less than required, money is wasted. To avoid this requires accurate surface finish measurement *at the machine.*

Up to now, finish has been judged at the machine by looking or feeling.



The new Brush SURFINDICATOR provides a fast, accurate method for determining right at the machine the degree of surface finish produced.

This need not exist any longer, for a portable tool has been devised that makes accurate surface finish checking a simple matter, *anywhere in the plant.*

New Tool Eliminates Finishing Losses

The Brush SURFINDICATOR* is an easy-to-carry surface finish measuring device that can be used by any worker wherever needed—for in-process checking of surface smoothness. With this new tool, it is possible to meet optimum specifications without wasting material, time or money.

The operation is simple. A hand-held stylus is stroked over the surface that is to be measured. A direct reading is obtained in microinches, and the worker or inspector immediately knows the exact surface finish already produced. Not limited to one material, the SURFINDICATOR can be used on metals, glass, plastic, paper, wood and other surfaces for maximum finishing economy.

Both the new ASA Standards and the complete Brush SURFINDICATOR description are contained in this booklet. Send for your copy now.

Find out all about this new portable tool that produces savings by preventing finishing waste in your plant. The full story is told in the informative Surfindicator booklet. Also included are the new ASA Standards on surface finish for industrial use. Write for your copy today. *TM

BRUSH ELECTRONICS COMPANY

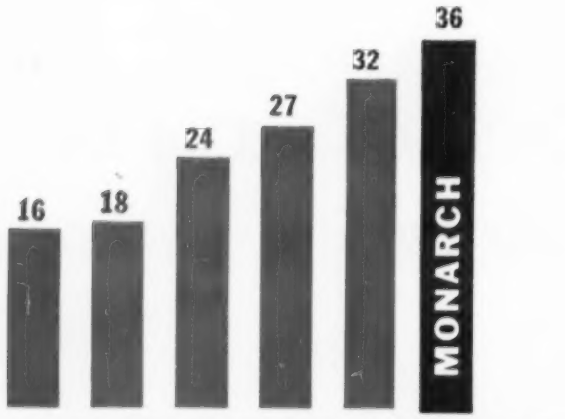
3505 Perkins Avenue, Cleveland 14, Ohio

BRUSH 6 ELECTRONICS

DIVISION OF CLEVITE CORPORATION

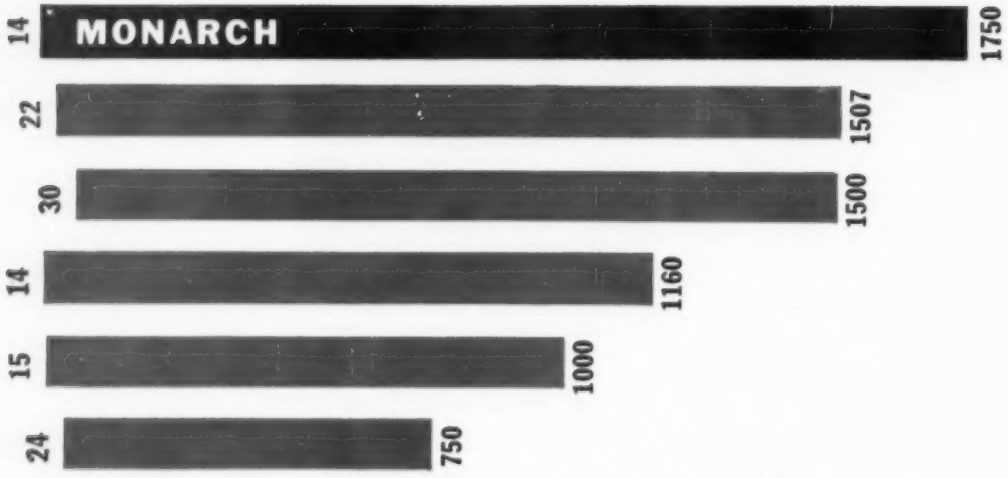
TALK ABOUT SPEEDS!

There's No Matching the Monarch Preselector Dyna-Shift



THE MOST SPEEDS–36

Unique Speed
PRESELECTOR
DYNA-SHIFT



UNEQUALED RANGE–14 to 1750

Surface Cutting Speed! These three words are the key to top efficiency in the operation of *any* lathe.

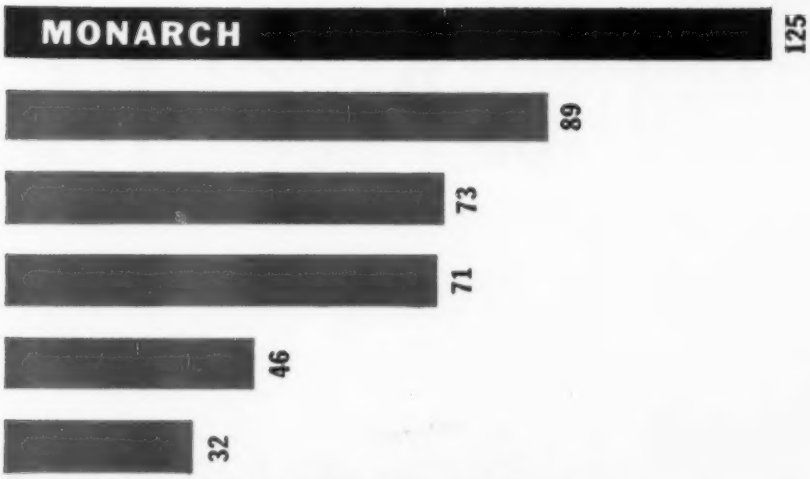
Certainly it's true, you say. But why bring that up? Because only now is a lathe available to give you, practically the correct surface speed, diameter after diameter, piece after piece. That lathe is the new Monarch Series 62 Preselector Dyna-Shift.

It has 36 speeds in a range of 14 to 1750 RPM. Headstock ratio is 125 to 1. And it has *speed preselection.* Here at last is a machine with a standard speed range low enough, high enough and with plenty of speeds in between to make unnecessary a whole assortment of special ranges. With this one standard range you have the power to turn efficiently any part within the work capacity of the lathe.

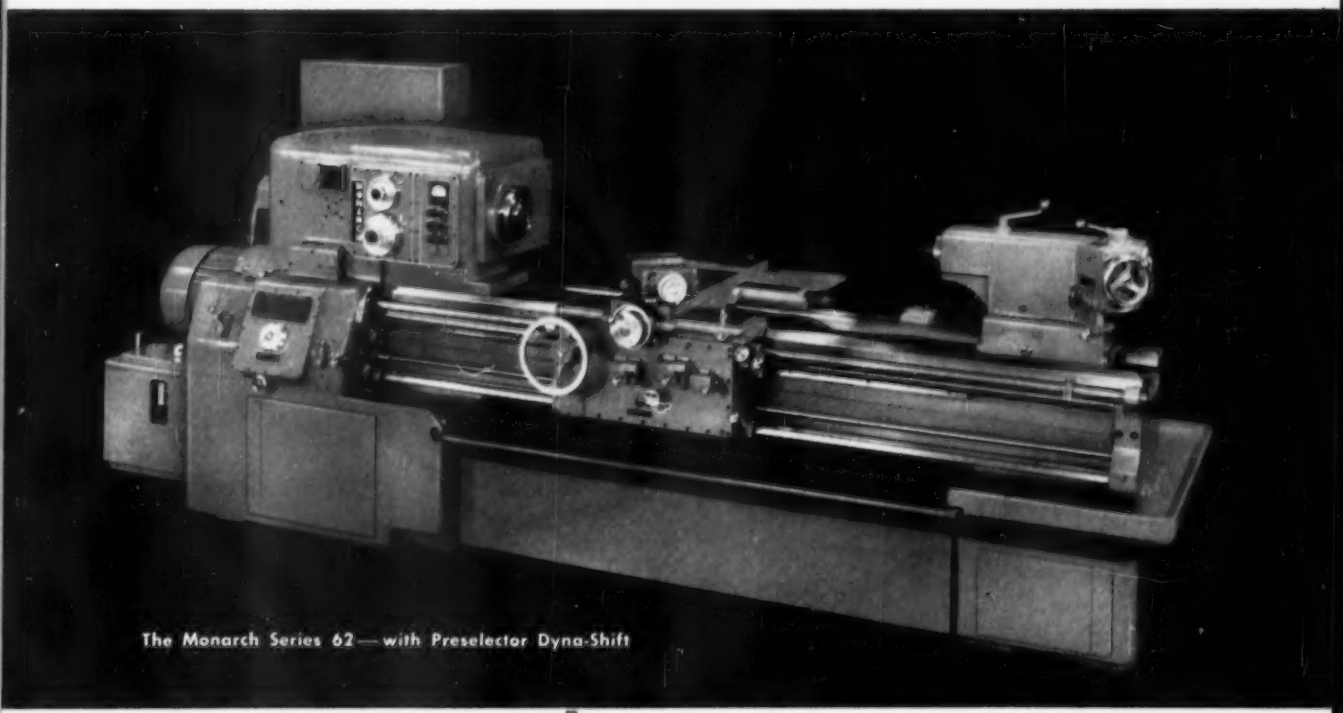
The Dyna-Shift feature makes it unnecessary for the operator ever to figure the R.P.M. he needs for the desired surface speed. He never has to be a calculating machine. He never has to get bleary-eyed figuring a lever setting combination from a complex index plate. He never has to be a color matcher. He never has to set a series of levers in a variety of positions as indicated by the index plate.

All he does is set two large dials on the Preselector Dyna-Shift—one for the work diameter to be turned, the other for the surface speed needed. The machine calculates the necessary R.P.M. and makes the shift automatically. With the preselection feature he may preset up to 6 or more different diameters and set up the shift for each while the machine is turning the previous diameter.

Nowhere but on the Monarch Series 62 Preselector Dyna-Shift can you get this combination. And no other machine can be kept under full load during the entire machining cycle for the utmost in metal removing efficiency. There's an area of cost reduction you cannot afford to overlook any longer. Ask us about it. ***The Monarch Machine Tool Co., Sidney, Ohio.***



GREATEST RATIO–125 to 1



The Monarch Series 62—with Preselector Dyna-Shift

PRODUCTION PLUS

The Monarch Series 62

Increases Productivity up to 25%*
Increases Tool Life up to 50%*

**Figures based on studies comparing step shaft output of Preselector Dyna-Shift with that of a conventional 16-speed headstock lathe.*

Monarch
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THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen:

☐ I am interested in your Series 62 story. Please send me your illustrated Booklet #1505 with complete data.

☐ Please have a Monarch sales engineer call on me.

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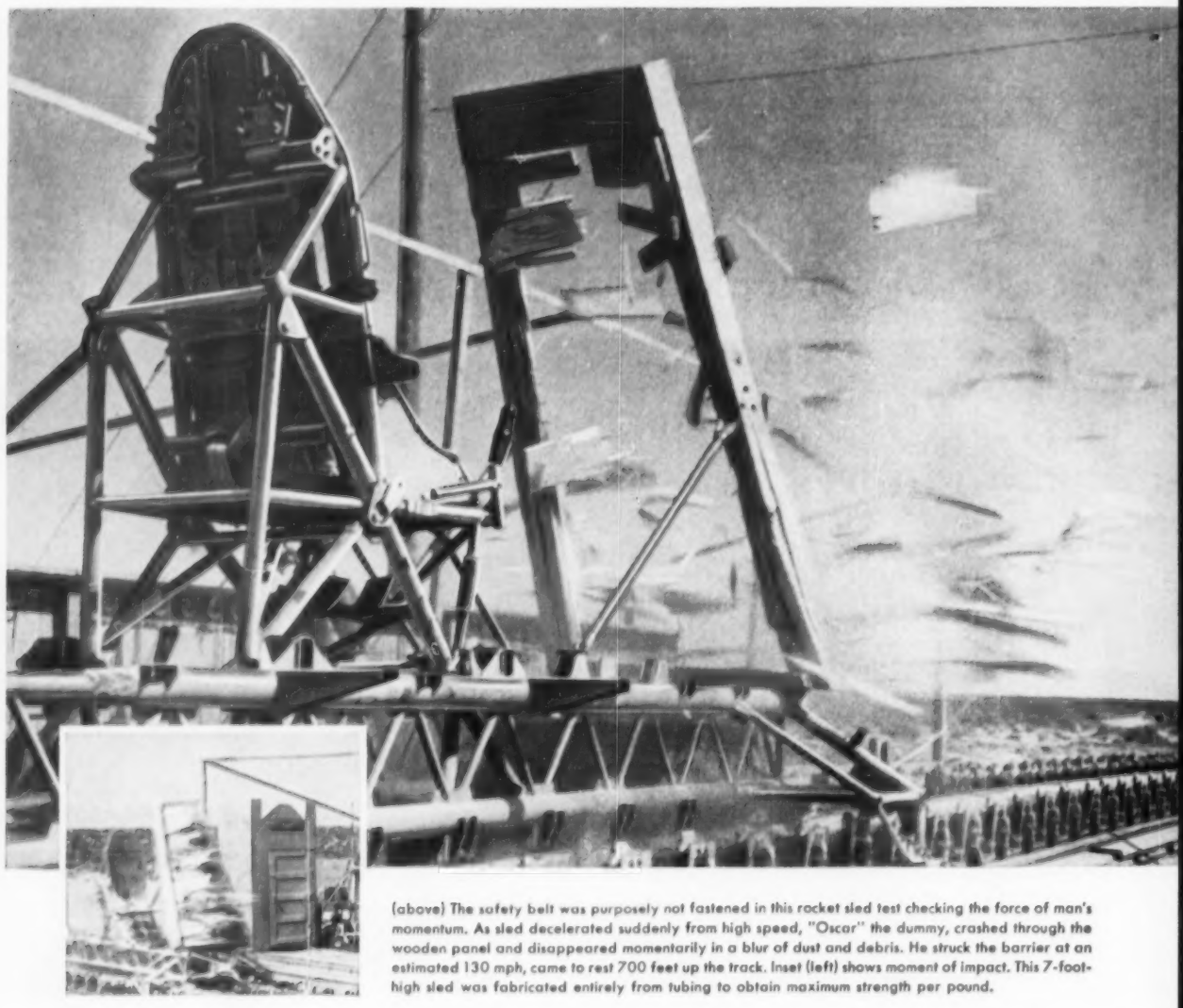

(above) The safety belt was purposely not fastened in this rocket sled test checking the force of man's momentum. As sled decelerated suddenly from high speed, "Oscar" the dummy, crashed through the wooden panel and disappeared momentarily in a blur of dust and debris. He struck the barrier at an estimated 130 mph, came to rest 700 feet up the track. Inset (left) shows moment of impact. This 7-foot-high sled was fabricated entirely from tubing to obtain maximum strength per pound.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

Construction is STRONGEST!

Where strength is an important requirement—such as this rocket sled application (left) for deceleration tests—manufacturers choose tubing for basic construction. They know that at any given weight, tubing is strongest of all mechanical shapes . . . as a beam . . . in torsion . . . under compressive loads.

And through many years of good experience, structural fabricators know that—dollar for dollar—Republic ELECTRUNITE® Steel Mechanical Tubing is their best buy. The original electric resistance welded tube, ELECTRUNITE is well-known for both quality and performance. It's available in a wide variety of sizes, gages, and shapes . . . in both carbon and stainless steel.

Predictable characteristics are assured because ELECTRUNITE tubing is made of Republic steel, to rigid Republic standards—each step carefully controlled from ore to finished product. Though produced in great volume, every length is consistently uniform, foot to foot, shipment to shipment. Wall thickness is uniform and so is concentricity. Surfaces are free from scratches and pit marks. It offers uniform response to heat treatment. It is easy to fabricate . . . often eliminates some costly fabricating or machining operation.

If you have a product that must be strong, safe and lightweight, investigate Republic ELECTRUNITE Steel Tubing. Republic's engineers can help you design it into your products or processes—economically and profitably.

Mail coupon below for all facts.

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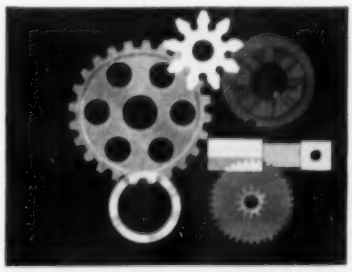
WHERE MACHINABILITY, STRENGTH, TOUGHNESS AND CORROSION-RESISTANCE are necessary, parts manufacturers use Free-Machining ENDURO® Stainless Steel Bars. Here is a metal unsurpassed in high physical and chemical properties, to which have been added the advantages provided by cold drawing—accuracy of section, close tolerance, uniform soundness and a fine surface finish. Republic metallurgists and machining specialists will give you expert, obligation-free assistance. Send coupon.



SMALL PARTS CAN OFTEN BE MADE FASTER, MORE UNIFORM—and at less cost using Republic Iron Powder. Complicated shapes, difficult to produce economically by conventional means, are easy to make by this new method. Republic metallurgists and engineers, with a thorough knowledge of all types of metals, can help you determine iron powder's suitability to your parts production. This service is available without cost or obligation. Just mail coupon.

THE PILOT OF THIS "EGG BEATER" IS SHIELDED from the power plant by a firewall, fabricated from .016 gage Republic Titanium, Type RS-70 Annealed. The extremely high strength-to-weight characteristics of this metal have made it possible to add range, speed and maneuverability to both military and commercial aircraft. Republic Titanium's very high resistance to corrosion also makes it useful for many non-military applications. If you have a strength-to-weight or corrosion problem, call your local Republic office. Send coupon for more facts.

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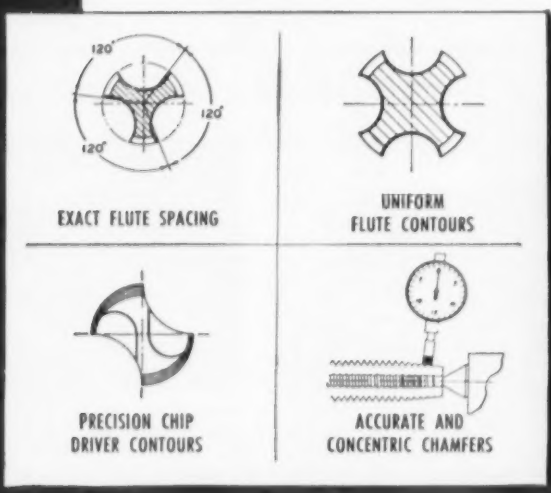

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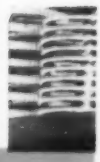

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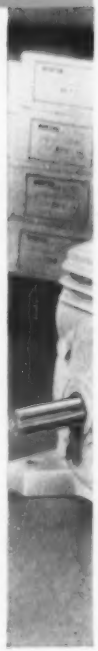
MORE HELP IN PLANNING — 50 pages of simplified engineering data make Catalog 56 your reliable aid for drive design, plant maintenance.

Boston Gear Works, 60 Hayward St., Quincy 71, Mass.



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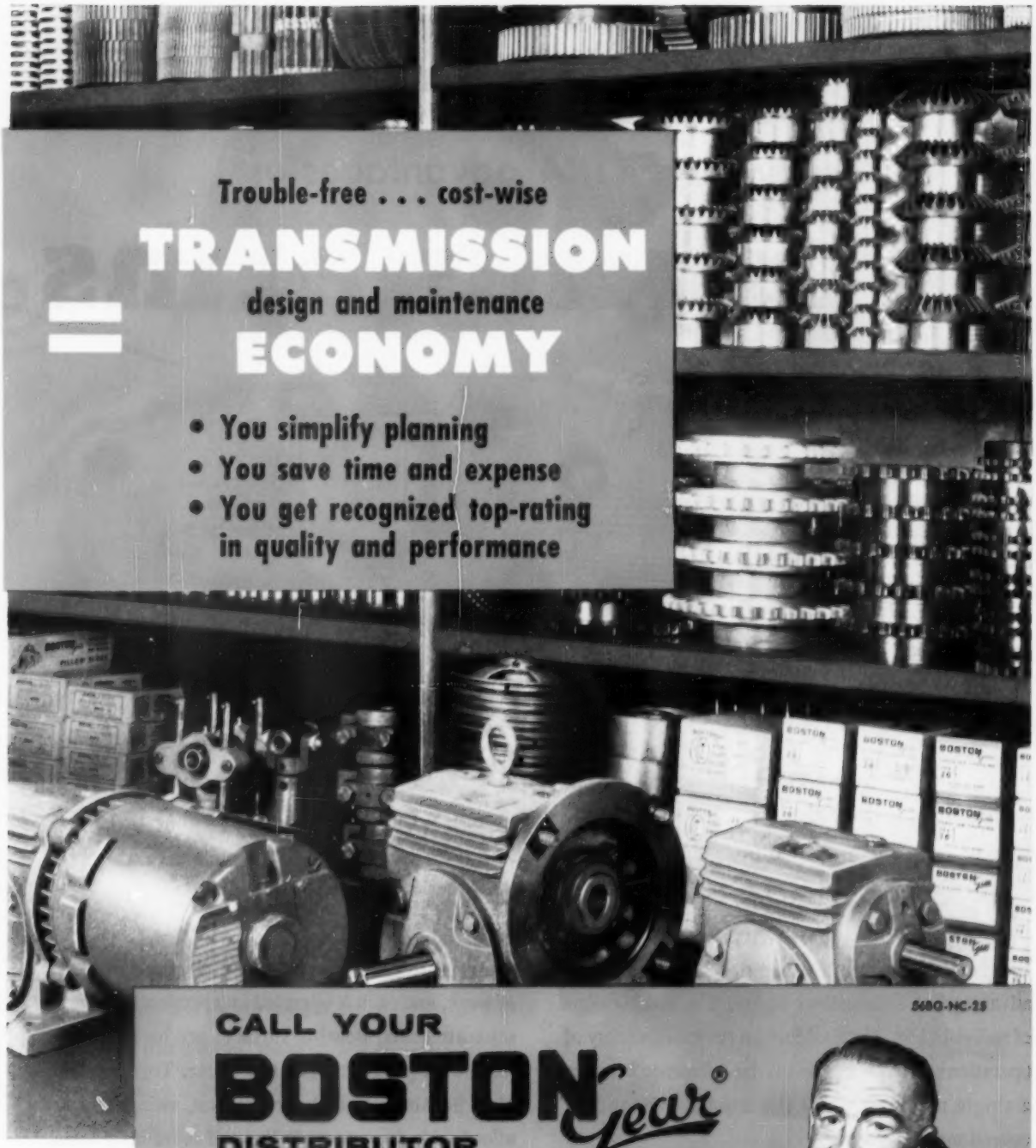

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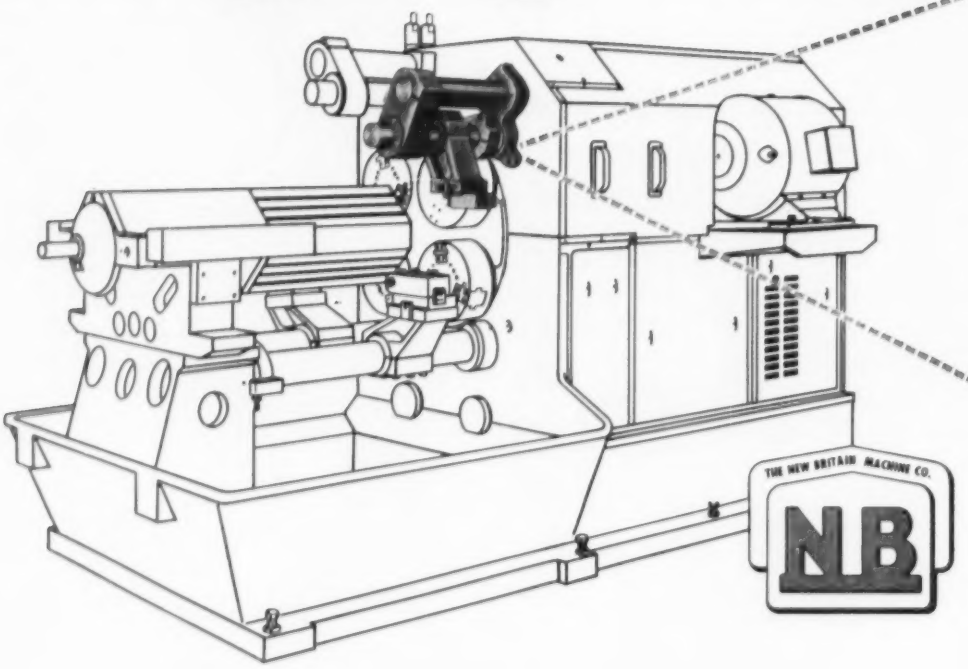
Only **New Britain** *Chuckers offer the EXTRA advantages of*

swinging arms

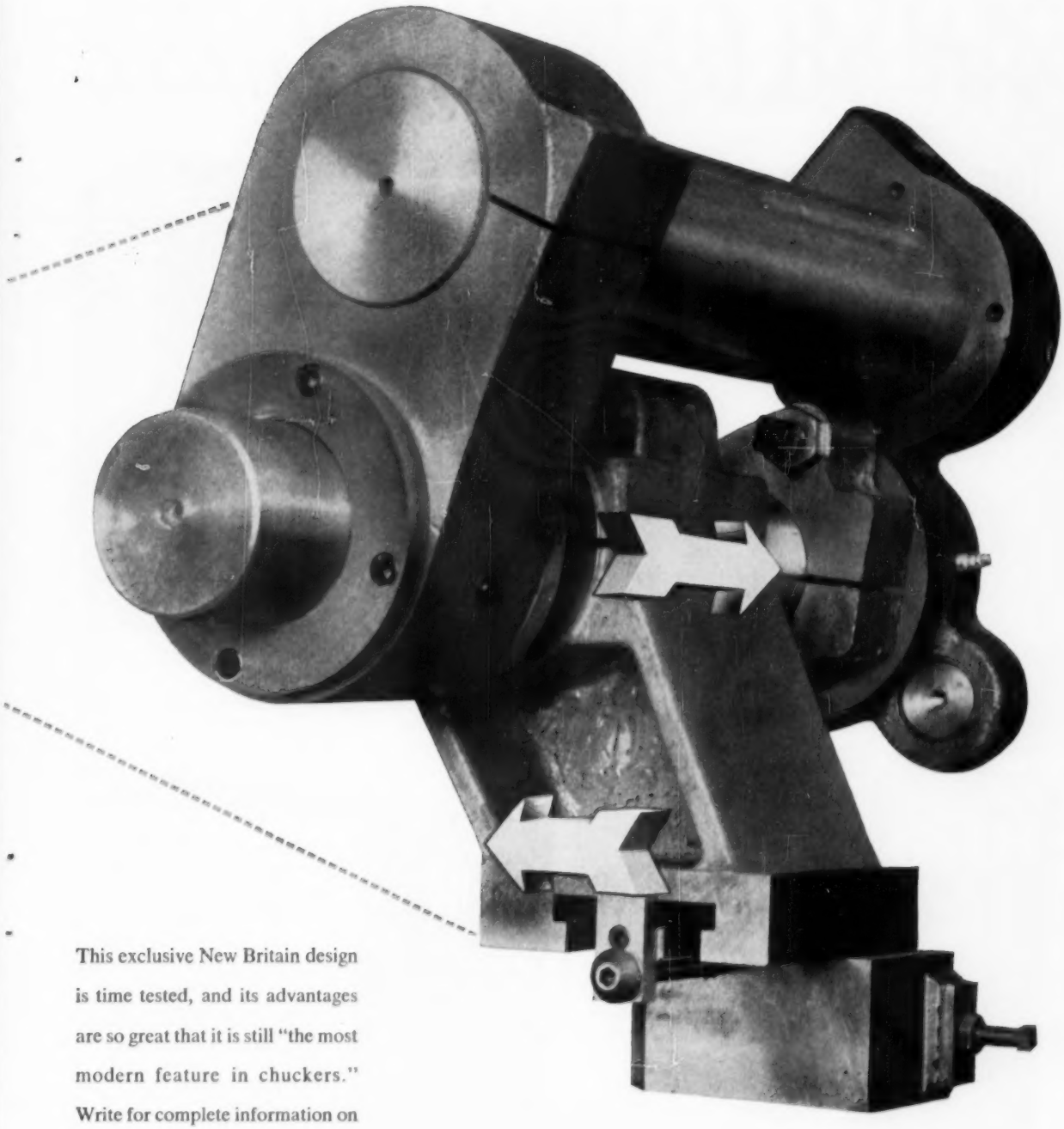


Independent swinging type arms have the PLUS advantage of *longitudinal* action. The combination of radial and longitudinal motion permits a variety of operations which often makes the difference between a single machining and the need for secondary operations.

Arms are positionable horizontally for *any length of work*, and each is operated independently through separate cams. Bearing surfaces are located away from wear-producing grit and grime. Together with New Britain open-end construction, swinging arms afford wide-open accessibility and more chip room.

NEW BRITAIN-GRIDLEY MACHINE DIVISION

The New Britain Machine Company — New Britain, Connecticut



This exclusive New Britain design is time tested, and its advantages are so great that it is still "the most modern feature in chuckers." Write for complete information on New Britain four-, six-, and eight-spindle machines, *now* with chucking diameters up to 15 inches.

AN ALUMINUM COST

This cost savings story points the way to more jobs in your shop

PART I

CAMERA TRIPOD PART Converted from steel to aluminum. Cost savings per 1,000 parts . . . 38.4%

. . . based on material and production costs per part of $1.90 for steel and $1.17 for aluminum. Figures given do not include the cost necessary for plating had steel been specified. Because of aluminum's attractive finish and resistance to rust, anodizing was the only finishing operation required. This part is one of a number of different aluminum parts used in the camera tripod.

PART IV

BUSHING — Converted from brass to aluminum. Cost savings per 1,000 parts . . . 53.3%

Lower raw material costs were entirely responsible for these savings. Only 22 pounds of aluminum at $.56 a pound were required for 10,000 parts. Brass, however, required 67 pounds for the same job. At $.42 a pound, the total cost for brass was $28.14, less $4.58 for scrap recovery. Aluminum's total cost was $12.32, less $1.42 for scrap recovery. Aluminum, therefore, provided a savings of $12.66 for every 10,000 parts produced.

PART V

WINDSHIELD WIPER KNOB INSERT — Converted from brass to aluminum. Cost savings per 1,000 parts . . . 24.8%

Because of the savings offered by aluminum, engineers tested it along with other materials for this particular application. They found aluminum would not only provide sufficient strength but would also take a slightly better knurl.

STORY IN FIVE PARTS

PART II
NOZZLE — Converted from brass to aluminum. Cost savings per 1,000 parts . . . 24.9%
Set up time and labor costs were equal between brass and aluminum. But brass required 32.4 pounds for 1,000 nozzles while aluminum required only 10.66 pounds. The difference in material cost, therefore, was $7.86 or 24.9% saved per 1,000 parts in lots of 10,000.

PART III
INSERT — Converted from steel to aluminum. Cost savings per 1,000 parts . . . 35%
Cost savings on this part were due to lower machine time and not raw material costs. Aluminum's faster machinability permitted a two-third reduction in machine time per 1,000 parts.

The five companies whose parts are shown here — like parts buyers all over the country—have discovered that Kaiser Aluminum stock can give them big savings and better quality.

Want more jobs in your shop?

You can confidently offer alternate bids in Kaiser Aluminum — *far lower bids* — even when specifications call for another material. As a result, you can usually quote below competition and get more business!

How you—and your customer—save with Kaiser Aluminum

You get *three times* as many parts from a pound of lightweight Kaiser Aluminum stock as from a pound of brass or steel. Thus, each part can cost far less.

Kaiser Aluminum stock often permits other important economies that help you offer lower bids to your customer. It eliminates expensive plating. It extends tool life. It reduces cleaning costs, because lightweight aluminum chips easily "float" from cavities. And its light weight greatly reduces shipping charges and cuts the cost of material and process handling.

Conversion to Aluminum

Converting to aluminum requires no additional investment in equipment. Aluminum is successfully machined on all existing automatic screw machines.

For more information or assistance, contact one of our many distributors, or look for our local number in the classified telephone directory under the heading "Aluminum." Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, Calif.

Kaiser Aluminum

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Technical Editor,
Kaiser Aluminum & Chemical Sales, Inc.,
919 N. Michigan Ave.,
Chicago 11, Illinois

Please send, without obligation, my 300 page hard-cover book on "Machining Kaiser Aluminum" which contains detailed technical data and tooling information.

Name_____

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Address_____

City_____ **State**_____

solve special production problems

BARBER-COLMAN offers

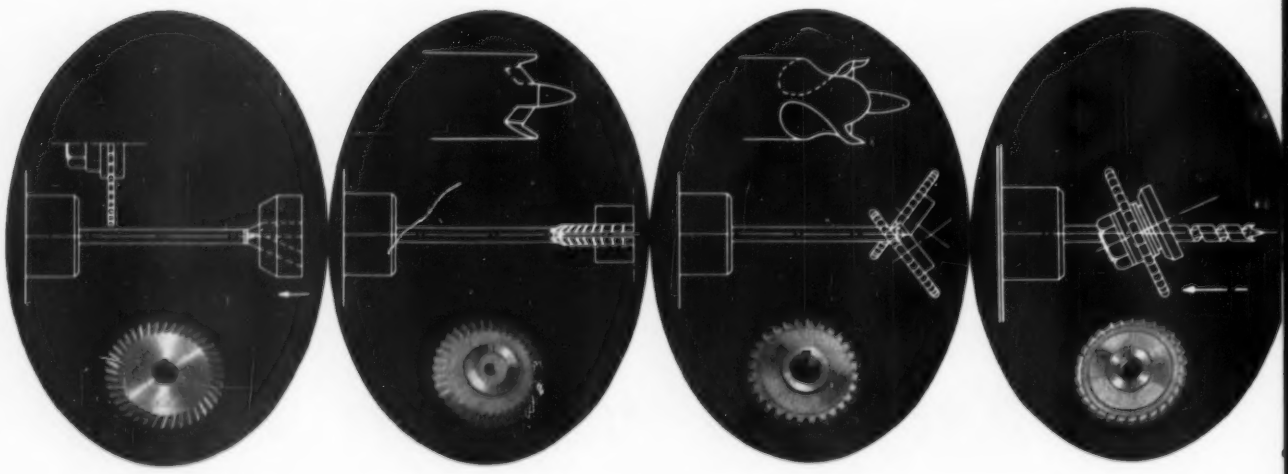
top engineering talent for milling cutter application and design

Milling Cutter Application

This is engineering talent for visualizing how a production operation can be best accomplished through developing the right milling cutters. Barber-Colman cutter engineers have developed this talent to a fine degree through nearly fifty years of cutter design and shop experience. This experience is available to you without cost when you ask Barber-Colman engineers to work with you on your production problems.

Milling Cutter Design

This is engineering talent for making milling cutters work better by combining certain physical elements into the cutter teeth. Such features include side cutting clearance, helical gashes, rake angles and cutter tooth form development, and are the result of many years of actual shop experience. These features, when applied correctly, increase the cutting efficiency and performance of the cutters, thereby producing better job economy.



Finished Bit Cut-Off

Topping Cut Forms Cutting Spurs — 2 Cutters

Throat-Opening Cut Forms Lead Edge — 2 Cutters

Milling First Flute

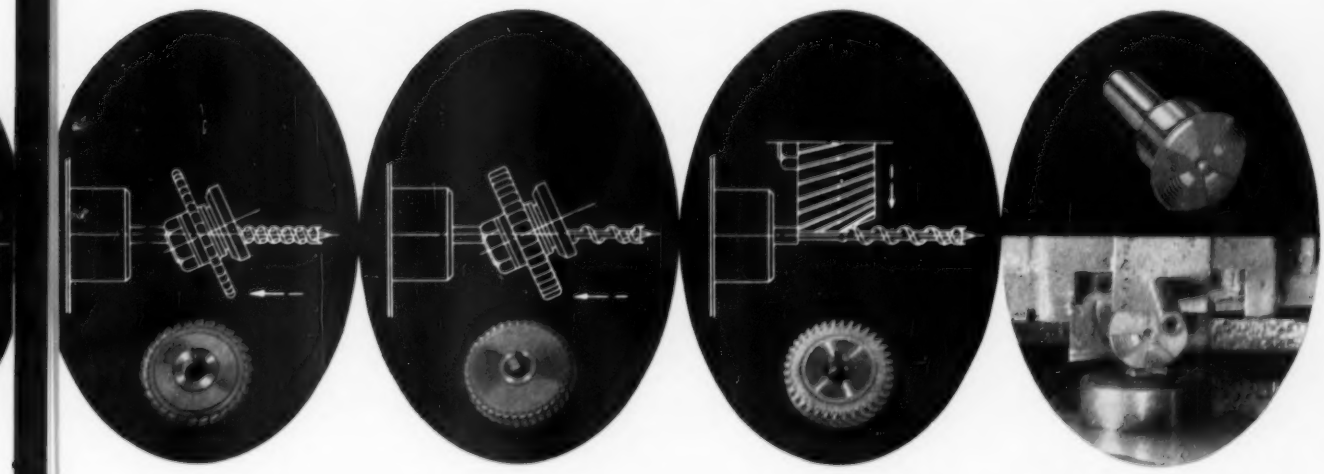
If you are seeking ways to improve production methods and cut manufacturing costs, consult Barber-Colman cutter engineers for counsel and suggestions on milling cutter application and design. Many times this cutter engineering advice can simplify your problems.

working with experienced cutter engineers

Greenlee eliminates hand operations, aided by Barber-Colman cutter engineers.

Greenlee Tool Co., manufacturer of wood boring bits, has eliminated costly hand operations and now produces bits automatically on controlled-cycle machines, using Barber-Colman special milling cutters. These machines, designed and built by Greenlee Bros. Co., were exhibited at the Machine Tool Show last year.

Greenlee engineers visualizing an automatic method to replace all hand operations, designed and built a battery of automatic machines which produce semi-finished solid-center auger bits from bar stock. They asked Barber-Colman engineers to help in the design of cutters which would complement the automatic operation. The sequence of operations is shown here with the corresponding cutters.



Milling Second Flute

Flute Milling Removes One Land

Taper Mill Shank

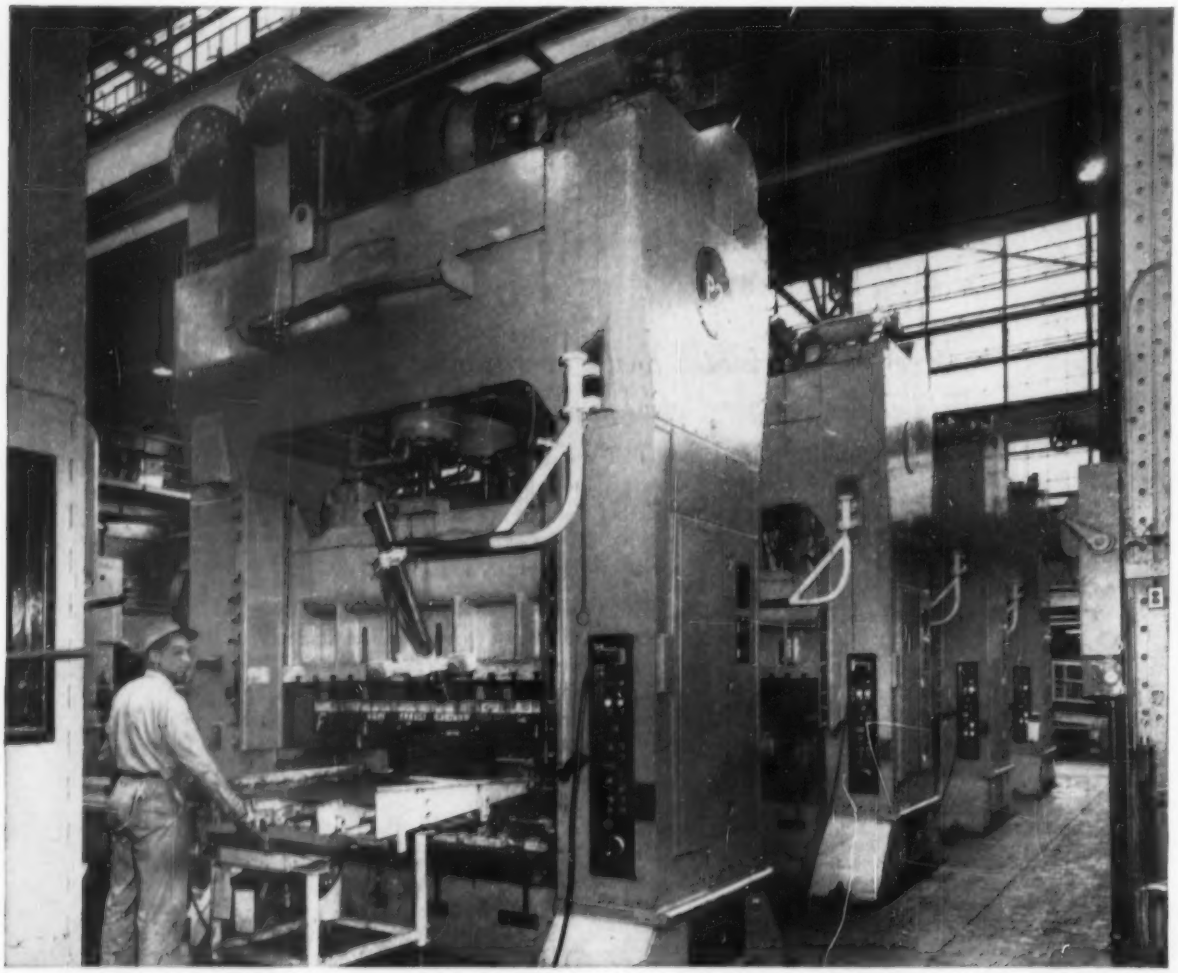
Thread Milling Screw Point

BARBER-COLMAN COMPANY

819 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN



Dependable CLEVELAND Presses Hold Automotive Stamping Costs Down!

These four Cleveland Presses recently installed at a leading automotive stamping plant are further testimony of the dependable performance built into every Cleveland Press. Their selection clearly indicates their ability to produce low cost stampings on high production schedules . . . indicates their ability to "stand up" under the demands of round-the-clock operation.

You, too, can earn extra profits by investing in new, more efficient Cleveland Presses. You'll find that the instant response and exact control made possible with the patented Cleveland Clutch speeds operation . . . reduces rejects. Their extra rugged construction assures reserve capacity . . . lasting slide alignment for continued accuracy. One of the 11 specialized types of Cleveland Presses is sure to be your answer to greater stamping economy. Write or call today!

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

POWER PRESSES — FABRICATING TOOLS

E. 40th & St. Clair Avenue, Cleveland 14, Ohio

Offices at: NEW YORK • CHICAGO • DETROIT
PHILADELPHIA • E. LANSING

CITY FOUNDRY DIVISION · SMALL TOOL DEPARTMENT

When a Lassie meets a Massey

Coming through the Rye

Massey-Harris-Ferguson that is, neighbor, whom you'll find in the rye and the wheat and all over farms 'round the world — because M-H-F products are vital to profits in farming.

And at Massey-Harris-Ferguson resistance welding is just as vital to profits in manufacturing.

The combination of ingenious production engineering and Sciaky resistance welding techniques achieves economy usually associated with mass production . . . *but* it achieves this economy on short runs of a wide variety of parts!

If *you* want to combine mass production economies with short production runs . . . look into Sciaky resistance welding — just like Massey-Harris-Ferguson did!

SCIAKY®

Largest Manufacturers of Resistance Welding Machines in the World

One of Massey - Harris - Ferguson's proudest achievements — the 90 Custom Special Self-propelled Combine.

Turn the page—Take a look for yourself at just a few of the advantages . . .

DRAW BAR AND KEEPER—Save 19¢ each over arc welding
BELL CRANK—Save 65¢ each over arc welding
YOKE—Save 83.75¢ each over arc welding; more satisfactory product
CRANK—Save $29 per hour of production over castings
LATCH — Save 4.29¢ each over arc welding
SPROCKET—Save $17.60 per hour of production over arc welding
UNIVERSAL—Save $19.40 per hour of production over arc welding
BEARING — Save over $1.00 each over casting
BELT TIGHTENER—Save $1.24 each over brazing

Mass Production Methods with Sciaky Techniques

save up to 60% on short run fabrication

Impressive cost reductions are only part of the Massey-Harris-Ferguson story — versatility, speed, and quality combine to result in an unusual success with a wide variety of short run applications.

Over 200 assemblies, formerly fusion welded, cast, or forged, are now made from standard, off-the-shelf stock and screw machine products. Average set-up time for resistance welding is only *30 minutes*. Fixturing costs have been reduced to less than $75.00. The field performance has been excellent!

Three standard Sciaky Three-Phase balanced load welders are used by M-H-F. Control set-ups for any job are quickly made from performance data charts. Production time is never wasted in try-out to prove weld quality.

"Resistance Welding At Work", Vol. 5, No. 1, tells the whole M-H-F story. Write for your free copy of this dramatic proof of Sciaky Basic design thinking — resistance welding techniques to put the profits back into manufacturing.

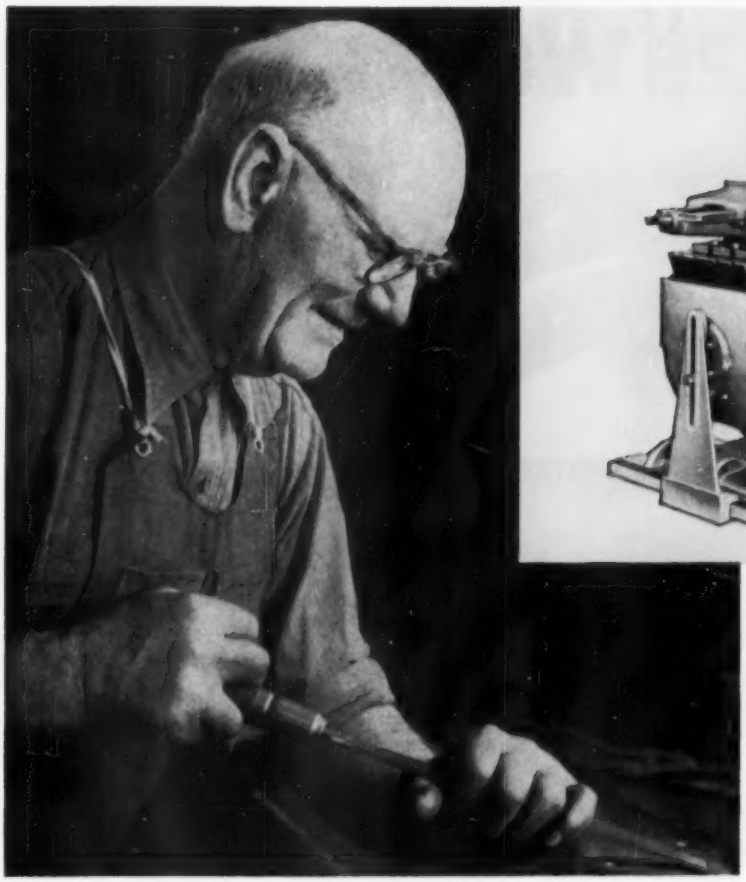
For specification welding such as required for air frame, jet engine and ordnance manufacture ask about the new Sciaky Predetermined Electronic Counter Weld Control.

One of three standard Sciaky welders in use at M-H-F showing the fixturing for producing a yoke.

Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

Sciaky Bros., Inc., 4924 W. 67th Street, Chicago 38, Illinois, POrtsmouth 7-5600



VMA Universal Shaper Model ES-26

UTOMORDENTLIG YRKESSKICKLIGHET

(SUPERB CRAFTSMANSHIP)

VMA SHAPERS - built by Sweden's master craftsmen - are engineered to maintain precise tolerances in continuous heavy-duty production. Built to U. S. standards, VMA Shapers—both heavy duty and standard models — meet all requirements for modern versatile machines.

VMA Model ES Heavy Duty Shapers, available in Plain and Universal Models and with 18", 22", 26", and 28" stroke, feature:

- Wide selection of ram speeds and power feeds
- Automatic forced lubrication system
- Horizontal power rapid traverse of table through independent motor
- Double helical crank gear
- Chrome nickel steel transmission
- Anti-friction bearings throughout
- Dependable safety clutch

VMA Model EV Series . . . economical standard-duty Shapers with stroke lengths from 14" to 24".

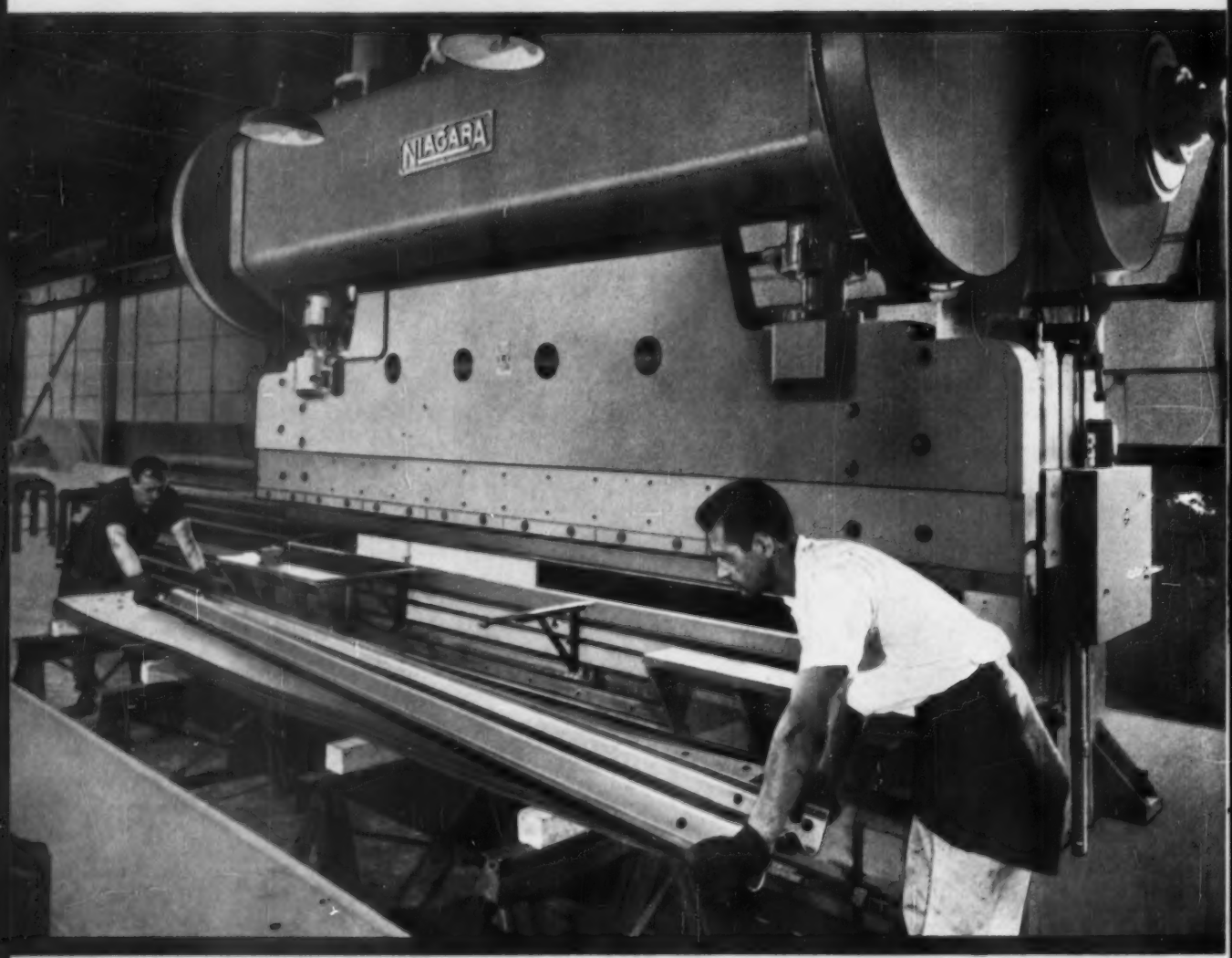
- Highly accurate and dependable, Model EV Shapers are ideal for job shop or tool room use not requiring the extra power of the ES Series. Easy to operate — economical to own.

austin

INDUSTRIAL CORPORATION

76-F MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

"we go back to



(Above) Forming highway guard rails from 12 gage steel on Niagara 520 Ton Press Brake.

(Right) Piercing rails with same machine.

(Far Right) Forming chair seat frames for office furniture from 20 gage steel on Niagara 150 Ton Press Brake.

Niagara for Press Brakes"

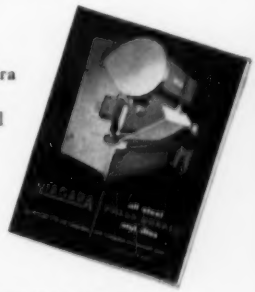
"The personnel of our organization has been acquainted with Niagara equipment for years. Niagara will stand behind *any* equipment furnished. Many millions of operations in the past 5 years on their presses and press brakes . . . equipment satisfactory from both the operational and safety standpoint. Our intention is to use the Niagara line entirely."

There in the words of one customer (a large Ohio metal fabricator whose press brake operations are illustrated), you have the sentiments of hundreds. Once experienced with *any* of the other metalworking machines which Niagara makes . . . presses, shears, bending rolls and dozens more . . . one just naturally thinks first of Niagara whenever the subject of press brakes comes up.

REASONS ARE MANIFOLD: (1) Extreme helpfulness of Niagara's engineers in selecting the machine and accessories that will do the job best (no other manufacturer can offer so complete and large a line of sheet and plate metalworking equipment). (2) Unrivaled reputation and experience in the field, dating back 77 years, that assure unquestioned reliability. (3) World-wide recognition for design leadership, combining rock-bottom operating economy and top-notch performance in *every* product it makes (take a moment to run down this partial list of imposing press brake features):

- *Double end twin drive with double reduction gearing for smooth, uniform application of power at both ends of ram.*
- *Rugged, all-steel frames with box type crowns of unequaled strength and rigidity.*
- *Extra heavy, rigid bed and ram for maximum support of dies.*
- *Gearing totally enclosed in sealed oil baths for thorough, clean lubrication.*
- *Longer lasting, laminated, nonmetallic ways.*
- *Powerful, smooth-acting, multiple disc clutch and brake.*
- *Gibs maintain accurate, endwise alignment of ram.*

Standardized in a complete line, ranging from 50 through 775-ton capacities, Niagara Press Brakes are built to produce a tremendous variety of work uniformly and accurately. Post yourself now on all the details by requesting Bulletin 89 D and, as soon as you can, avail yourself of some really worthwhile suggestions from a Niagara representative. Write.



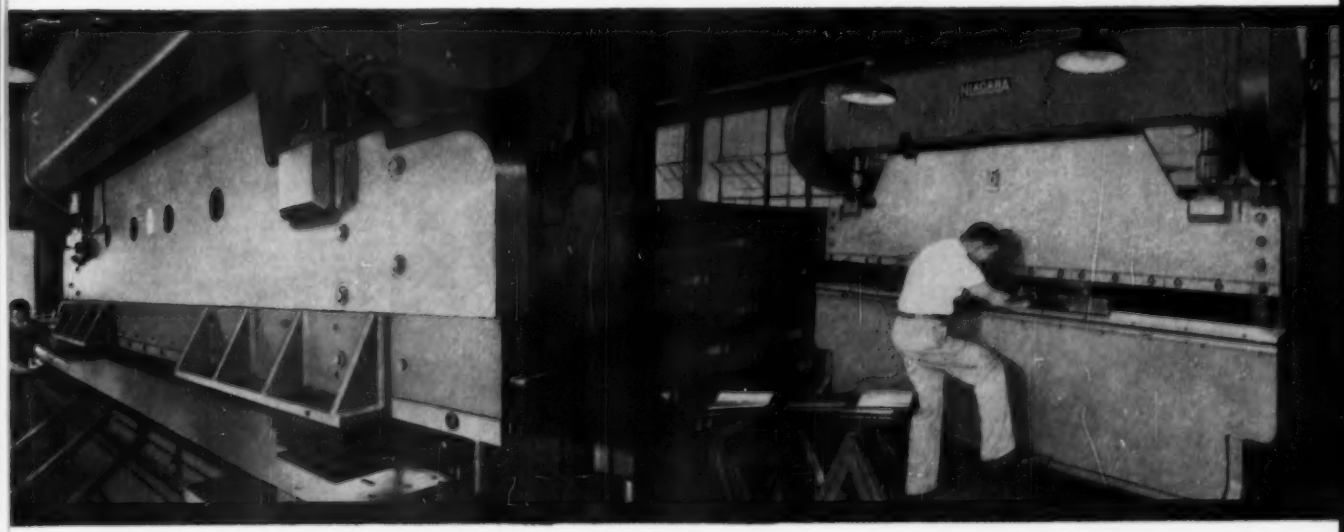
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U.S. cities and major foreign countries

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work



NIAGARA PRESS BRAKES

Mister, you're looking at a panelboard that's really built for Heavy Duty!

The heart of this QMB Saflex Distribution Panelboard is the quick-make, quick-break, horsepower rated switch unit.

It's loaded with features—

- Each switch unit individually enclosed in heavy gauge steel
- Dead front construction
- Heavy duty cast operating handle
- Double-spring mechanism insures positive opening under full load
- Visible blades for maximum safety
- Positive pressure fuse clips and switch jaws assure maintenance-free connections
- Cover interlock prevents unauthorized access but makes normal maintenance easier

QMB Saflex Distribution Panelboard

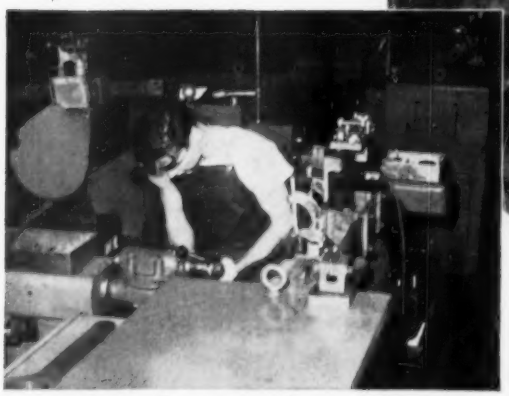
Here's a panelboard that's built for the tough jobs! But it goes a lot further than rugged construction. It's designed with plenty of space for easier wiring and maintenance.

Write for...

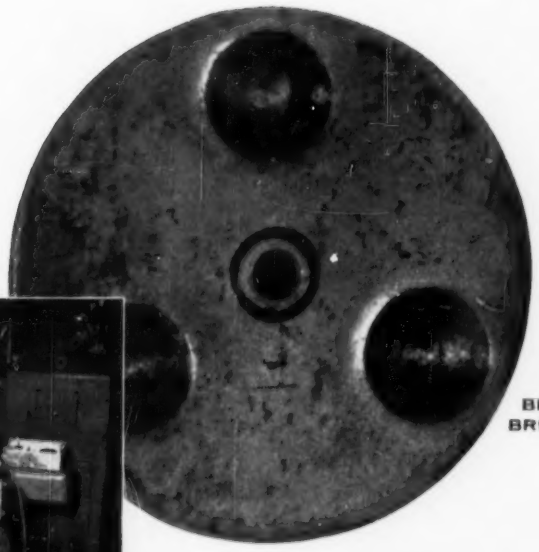
Bulletin S D-29 for further information
Address: Square D Company,
6060 Rivard Street,
Detroit 11, Michigan

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY



A manufacturer of computers and business machines improves the quality of precision components, greatly reduces costs using Osborn Brushamatic machines.



BEFORE BRUSHING

AFTER BRUSHING

Low price on high finish

A few years ago, precision parts were finished in custom lots at considerable cost. Today, Osborn power brushing methods put finer finishes on precision parts at mass-production rates.

The business machine component shown above is typical. Brushamatic® Machines put a high, mirror-like finish on all flat and depressed surfaces of this ball retainer in just 25 seconds—*finish 6 parts for the former cost of finishing 1.*

An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, will show how *you* can use Brushamatic® methods to produce finer finishes at lower cost. Write THE OSBORN MANUFACTURING COMPANY, DEPT. C-50, 5401 HAMILTON AVENUE, CLEVELAND 14, OHIO.

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

It's not always possible to launder *all* the chips or filings out of ordinary wiping material. Chips come back to scar men and metal, to plague your production line. This man has already had four wiper cuts.

He had 4 wiper cuts last month

They're easy to distribute . . .

They really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

Chips can't hide in a clean Scott Wiper. Each Wiper is brand new, fresh from the carton. A man takes a Scott Wiper as he needs it . . . uses it for his face, his hands, his product.

...He had none!

The difference is . . . Scott Wipers

This is sanitary wiping. A man uses a Scott Wiper thoroughly, throws it away—takes a new one. No danger of cuts from hidden chips . . . no fear of skin infection from dirty wipers . . . when you take a fresh wiper from the carton.

And because Scott Wipers are disposable you save in many other ways. Sorting and baling are eliminated. Handling and distribution are simplified. Laundering becomes a thing of the past.

Your local Scott representative or distributor is ready to demonstrate in your plant any time you say. Call him or mail this coupon right away.

Another quality product of . . .

SCOTT PAPER COMPANY

Scott Paper Company
Dept. W-5, Chester, Pa.

Please send me more information about Scott "Throw Away" Wipers.

Name _____

Company _____

Position _____

Address _____

the finest high production lathes

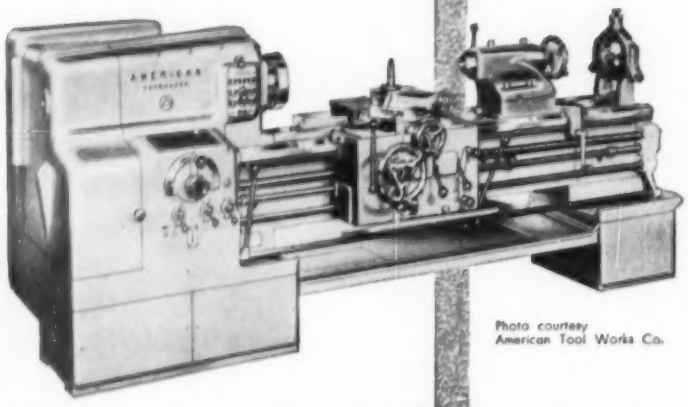


Photo courtesy American Tool Works Co.

Here is the new 16" DeLuxe Model "AMERICAN" Pacemaker Lathe. This new design places particular emphasis upon the factors of power, stamina, dependability, precision, accuracy and ease of operation required for both production and tool room service. For complete data write for Bulletin No. 116, The American Tool Works Co., Cincinnati 2, Ohio.

deserve the finest high production chucks

This is Horton's 3-Jaw Scroll Universal Chuck which for more than 100 years has been the companion to the world's finest lathes. Its lasting accuracy and precision contribute to the high production of any tool room or plant. For the complete story on this and Horton's complete line of high production chucks, see the Horton people in your area now.

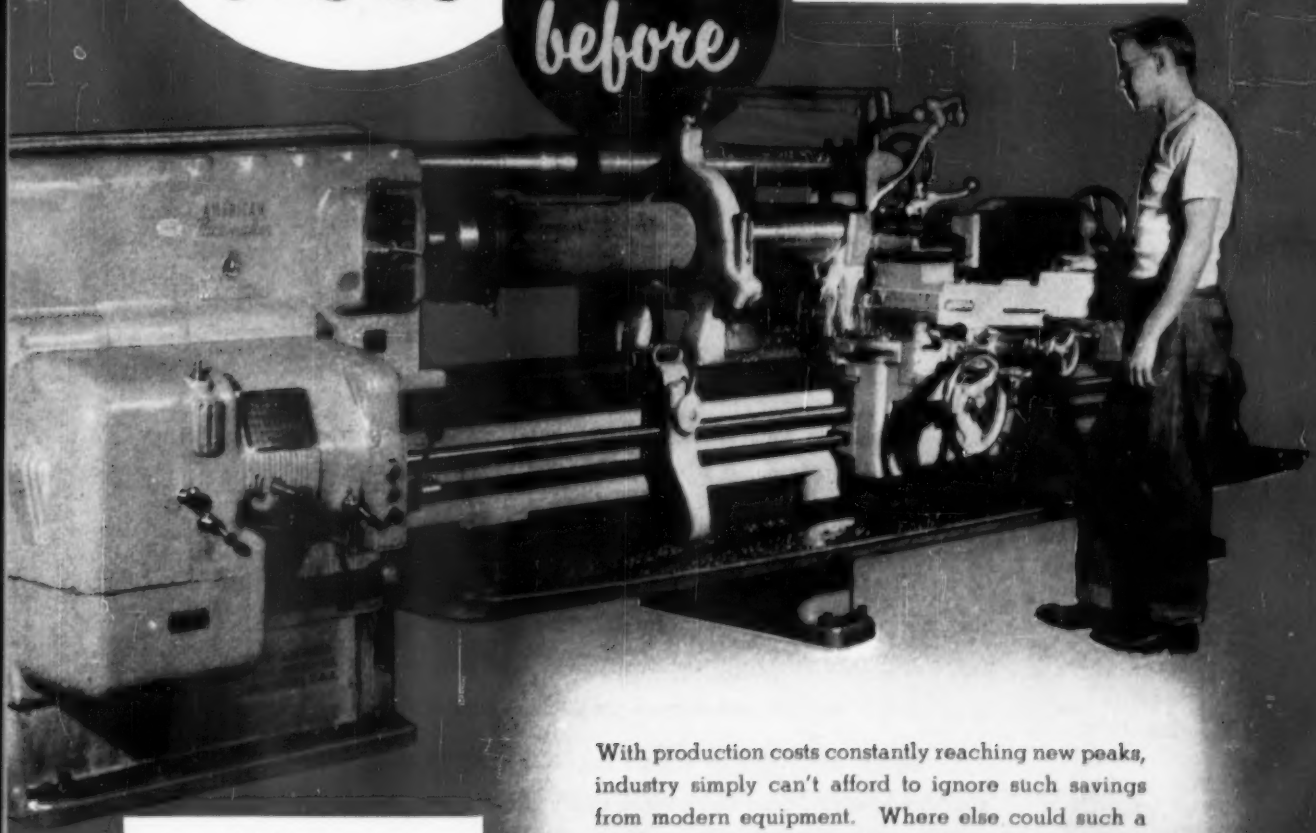
HORTON Since 1851 CHUCK

HORTON CHUCK DIVISION
GREENFIELD TAP AND DIE CORPORATION
WINDSOR LOCKS, CONN.

2¼ hrs. now

9 hrs. before

Fairbanks, Morse & Co., Beloit, Wisconsin, is *really* putting the payroll dollar to work with its new 20 inch "AMERICAN" Heavy Duty All-Hydraulic Duplicating Lathe.



2000 horse power Fairbanks-Morse motor shafts are now being rough and finished turned in 2¼ hours floor to floor against a former time of 9 hours per shaft.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

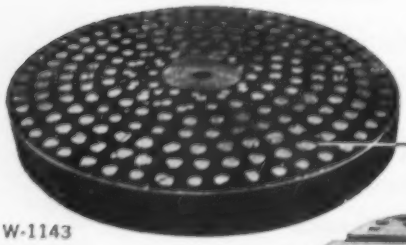
More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

Put your payroll dollar to work for greater profits with "AMERICAN".

Bulletin No. 35 shows many examples—it's yours for the asking.

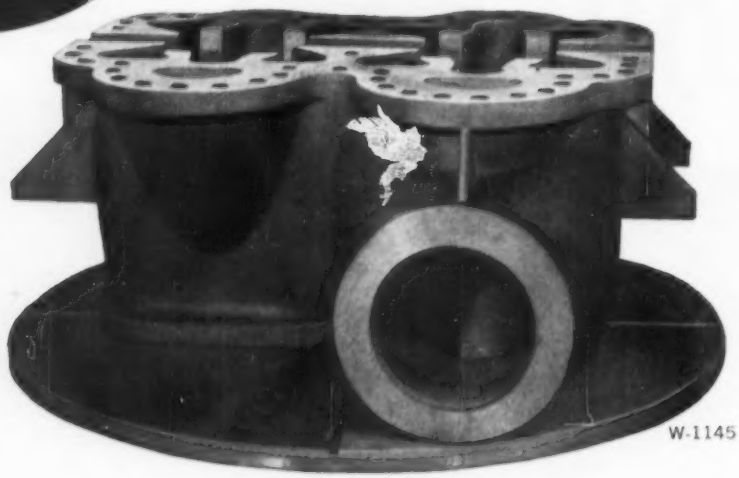
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



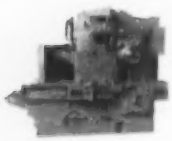
W-1143

tiny or **tremendous...**

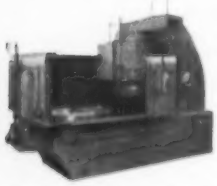


W-1145

For best results...***PUT IT ON A BLANCHARD!***



Blanchard No. 18



Blanchard No. 42-84

There's a Blanchard for every surface grinding job, in a broad range of sizes. For example, the Blanchard No. 18 grinds non-magnetic transistor elements (upper left) .006" thick, to a tolerance of .0005" with good finish. This job, which involved .006" to .008" stock removal per side, was held on special fixture plates.

At the other end of the scale, a huge Blanchard No. 42-84 Grinder grinds a turbine housing (upper right) which measures 83" across the corners, and is 28" high. This housing, ground after rough machining, required .020" stock removal. Both this piece and its mating part were ground to a steam-tight joint.

Whatever *you're* grinding—be it tiny watch parts, giant steel plates, or anything in between—there's a Blanchard designed to do the job speedily and accurately.

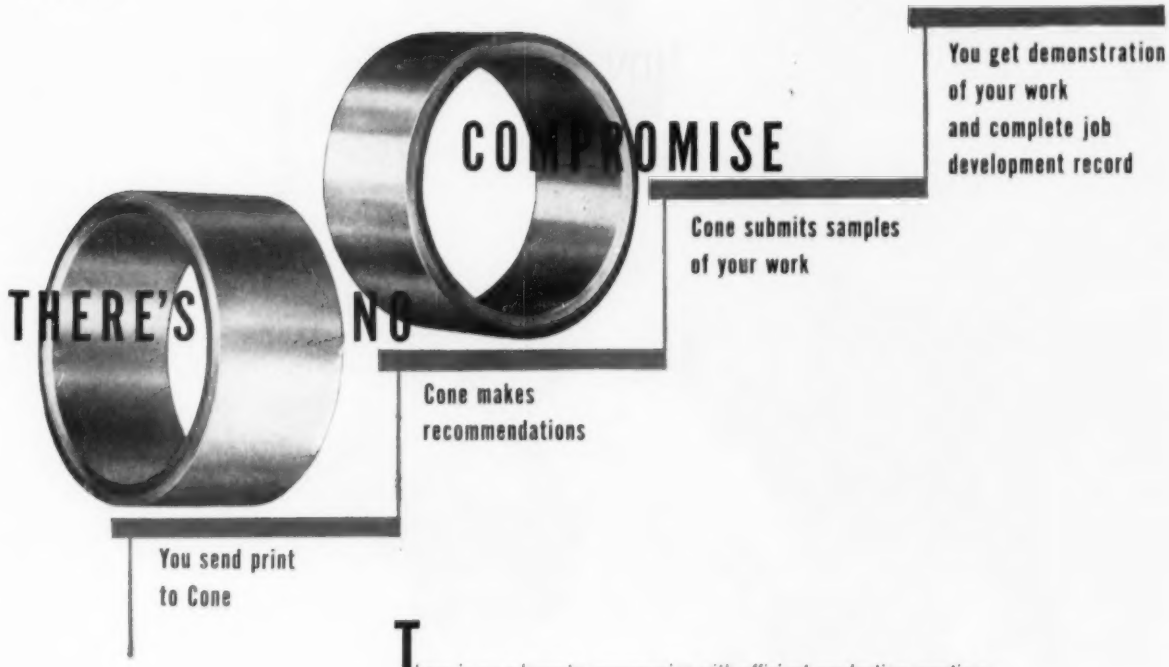
Ask for details on the 15 standard Blanchard models.

PUT IT ON THE BLANCHARD

Send for free copies of "Work done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

No. 6 in a series


THERE'S NO COMPROMISE
You send print to Cone
Cone makes recommendations
Cone submits samples of your work
You get demonstration of your work and complete job development record

There is no adequate compromise with efficient production practices, if you are in business for a profit.

But you don't always know just how competitively efficient your equipment is. Case histories of what the other fellow is doing are sometimes garbled. At least the poor ones are not advertised. And conditions vary in all plants. Sometimes you have reason to be more concerned with what you don't want in new equipment than with what you do want. Cone believes too much is at stake for a machine to go into a line unequipped for the job, with either carbide or hss tools.

The Conomatic Carbide Development treats each job individually from standpoint of work, machine, tools, and operating personnel.

DATA FOR COMPARISON

Part	Bushing	Length	⅝"
Machine	1⅝" Conomatic	Hole Dia.	1¼"
Tools	100% Carbide Tipped	RPM	825
Material	8620	Time	14.8 Secs.
Stock Size	1⅞"		

Conomatic

For particulars send for "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

still the winner

...and in high speed steels, nothing beats REX

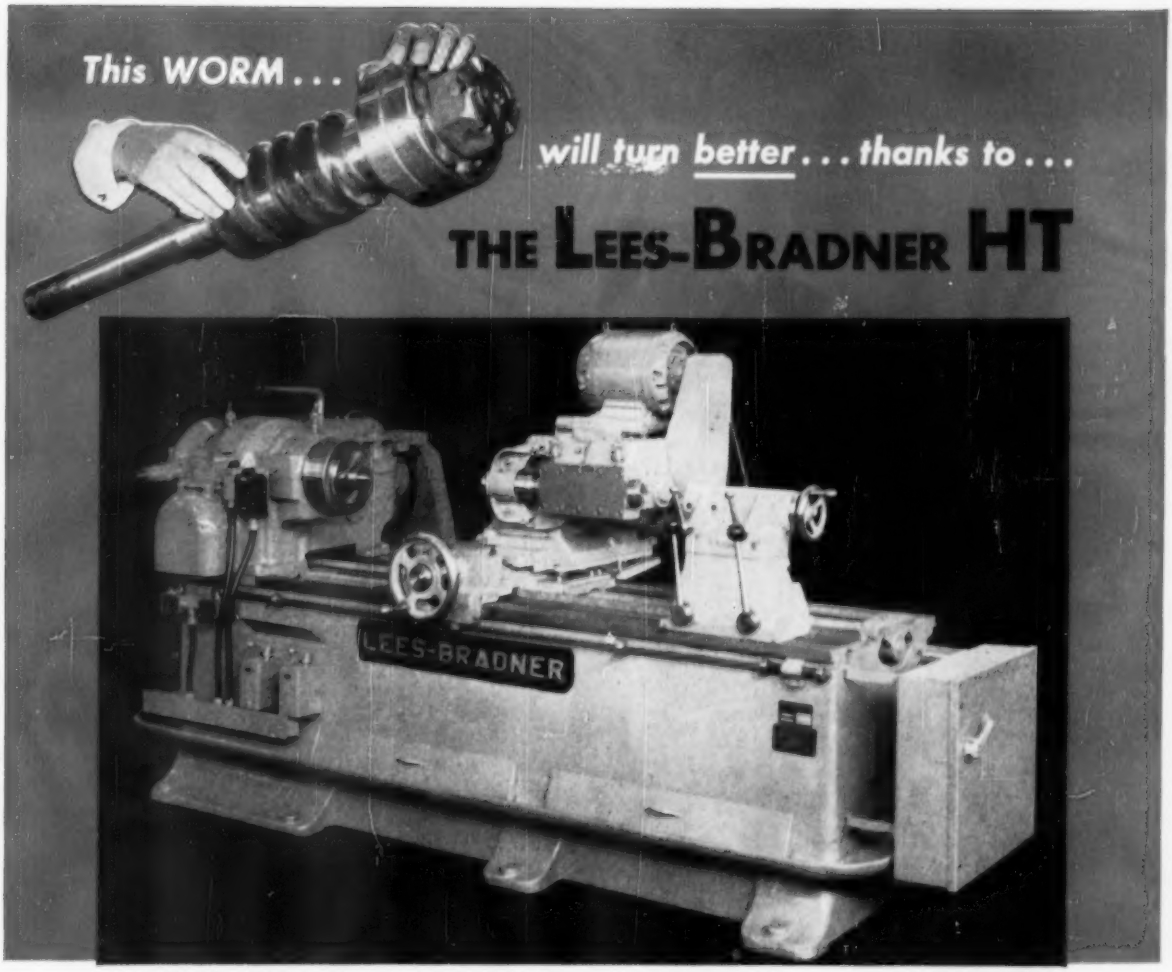
The winner and still champion after fifty years is Crucible's REX high speed steel. *And now it's better than ever!* Recent improvements in manufacturing processes have given even higher quality and greater uniformity to every one of its properties.

Why not shop test the new REX yourself? Test it for size, structure, response to heat treatment, fine tool performance. Give it any test you wish. You'll see why it is today, as it has always been — *the standard by which all other high speed steels are compared.*

Ask for REX by name at your local Crucible warehouse. Or order it directly for prompt mill delivery. And for information on REX, and the other Crucible special purpose steels, send for the *Crucible Publication Catalog. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



Building precision into other machine tools is the unique distinction that can be claimed for The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced on this machine by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728" with an outside diameter of 4.625".

Many tough thread milling problems like this have been, and are being, solved by this remarkably versatile machine.

Contact us or your local Lees-Bradner representative for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

Details on Worm Gear Production

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420"
Pitch Diameter	3.728"
Outside Diameter	4.625"
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

Ask FEDERAL *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

A LIFETIME DIAL INDICATOR
HEAVY DUTY MODEL

with the maintenance-free "H" Movement

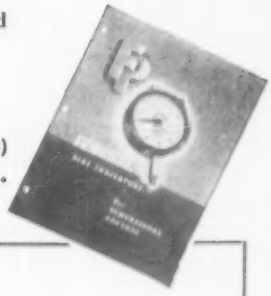
Rugged — shockproof — withstands more impact. Improved life under all conditions. All gears, racks, and pinions precision hardened — friction reduced 16% to 25%, depending upon magnification . . . a new high in sensitivity. Calibrated accuracy greatly improved. Off-white dials and fine line graduations facilitate readings. Available in four sizes. Enthusiastically received in shop tests.

You can get the NEW FEDERAL Dial Indicator:

- **In 47 Regular Models (Any B, C, D, or E Size Model listed on page 4 of the Catalog)**
- **In 7 Wetproof Models (All Wetproof Models listed on page 6 of Catalog)**
- **In 2 Long Range Models (C8IS and D8IS, shown on page 7 of Catalog)**

SEE ALSO NEXT PAGES

TO SPECIFY . . . the NEW style Hardened Gear Indicator, merely add "H" after Model No. desired.



If you don't have the NEW DIAL INDICATOR CATALOG (No. 55) and PRICE LIST, be sure to fill out coupon and mail it today . . .

FEDERAL PRODUCTS CORPORATION
6123 Eddy Street, Providence 1, R. I.
Please send Dial Indicator Catalog 55

Name _____
Company _____
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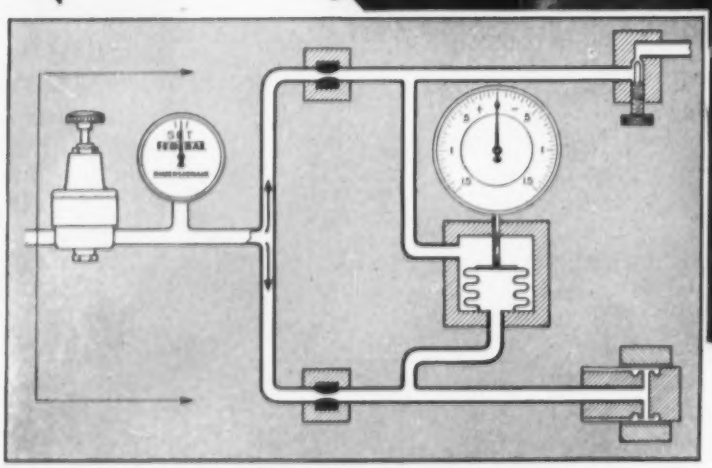


The Dimensionair System is stable because the measuring side is *fixed*. It cannot drift.

WHY more and more people decide to buy the DIMENSIONAIR

As more people have the opportunity to experience the basic advantages of the Dimensionair their enthusiasm for its dependable accuracy has greatly influenced the swing to this air gage which does not drift. Its graduated scale is positively linear and can be depended upon to remain stable under normal gaging practice.

The stability of the Dimensionair is due to its differential air system which cancels out minor pressure variations and surges. The *measuring side has no zero adjustment* in it. It is positively *fixed* and *cannot change.* The gage magnification remains stable for hours — days . . . indefinitely. It does not drift.

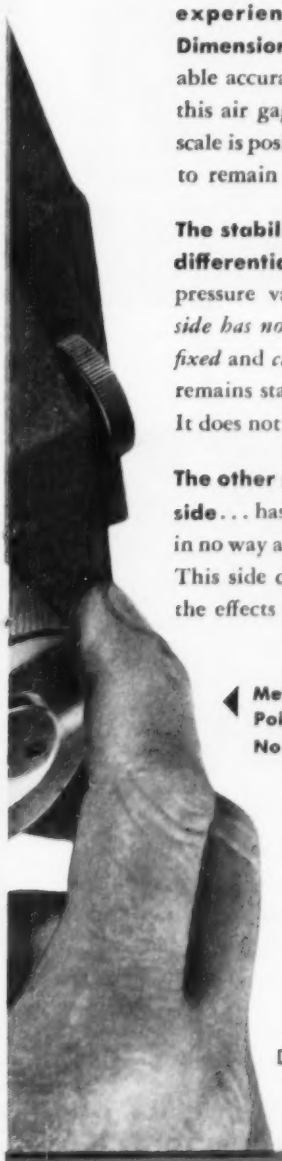
The other side of the system . . . the balancing side . . . has the zero setting adjustment which can in no way affect the stability of the measuring side. This side can also be adjusted to compensate for the effects of temperature changes in the gaging plug or unit. Temperature variations do not affect the accuracy of the Dimensionair system itself.

Another great advantage of this system is the simplicity and positive directness with which the gage is set to zero. Since the measuring system is rigidly fixed, the gage is instantly set to zero without trial and error adjustments.

Let your inexperienced operators try it. You can't appreciate how dependable and foolproof it is until you and others in your department or plant actually try it.

Ask our nearest Branch Office to let you try a Dimensionair.

FEDERAL PRODUCTS CORPORATION
EDDY STREET • PROVIDENCE 1, R. I.



Meter is extremely simple, and wearfree. Pointer movement is fast and positive. No bobbing.

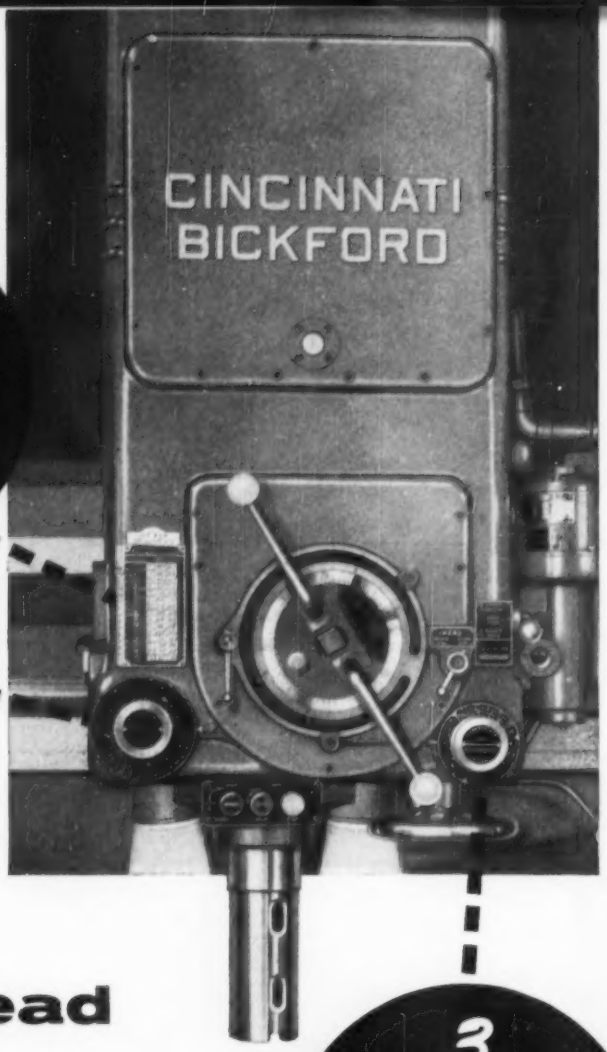
Federal's solution to the cost of gaging:

- Impartial Gage Selection
- Engineering Follow-Through
- Everything In Gages

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging



1.

The Prescheduling Chart plans the sequence of operations . . . charts the proper speeds and feeds . . . is a permanent record of each tool diameter, speed and feed.

2.

Speed Dial — Preselects any one of 36 speeds while machine is in operation—shift is automatic at end of each operation.

The HEAD that's way ahead

. . . brings you 3 outstanding performance features!

3.

Feed Dial—Preselects any one of 18 feeds for next tool while machine is in operation — shifting is quiet and direct.

The concentration of complete control of all speeds and feeds by two easily read dials on the head is an outstanding advance in design.

Saves time — insures controlled correct operation — and is easy for the operator.

Hydraulic shift for speeds and feeds is quiet and positive. All mechanism for preselection is contained in the head. These ultra modern Super Service Radials have many other advanced features — for easy handling and high productivity.

Write for Bulletin R-33. You will be interested in the many new features.

CINCINNATI BICKFORD

SUPER C B SERVICE

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

PRODUCTION "at all time Peak"

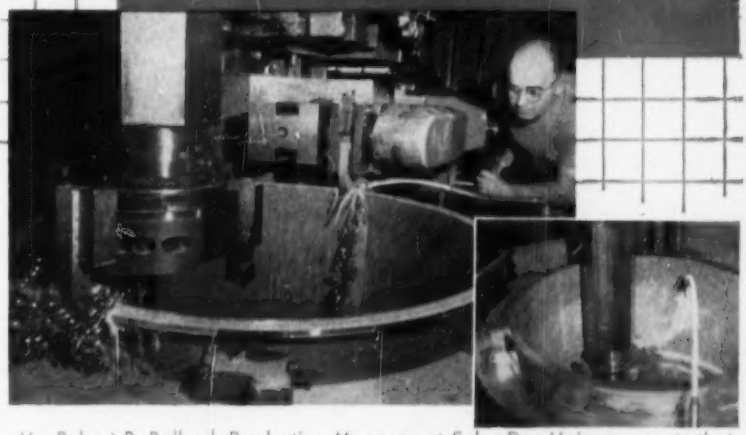
with BULLARD

MAN-AU-TROL

VERTICAL TURRET LATHE

MODEL 75

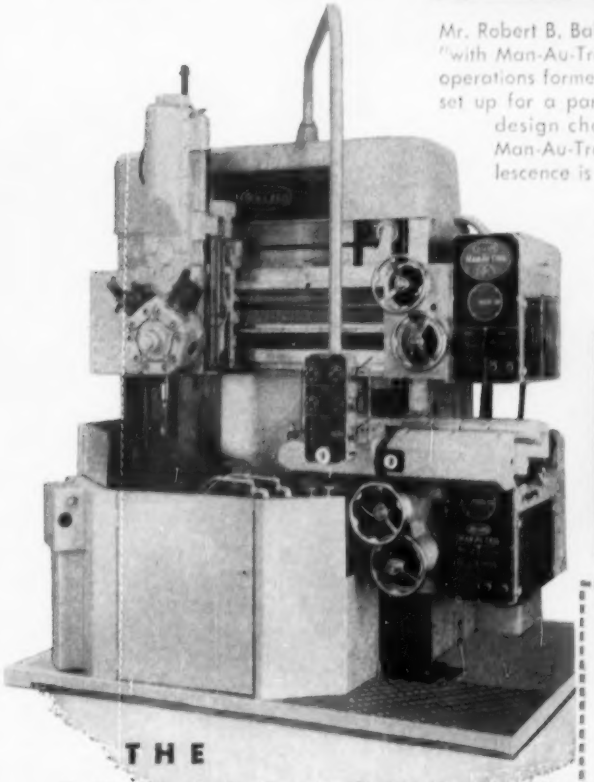
Solar Aircraft Company of Des Moines, Iowa and San Diego, California, has found the versatility and flexibility of the Bullard Man-Au-Trol V.T.L., Model 75 a distinct advantage in the machining and fabricating of various jet aircraft engine parts and assemblies.

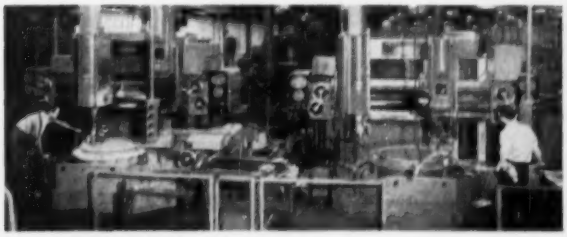


Mr. Robert B. Ballard, Production Manager at Solar-Des Moines, reports that "with Man-Au-Trol, Model 75, it is possible to do a multitude of machining operations formerly requiring numerous expensive machines which had to be set up for a particular operation, so limited in scope, that an engineering design change either obsoleted the tooling or the machine. With Man-Au-Trol, Model 75, because of its wide range of functions, this obsolescence is greatly reduced — if there is a design change, only a new set-up is made — not the purchase of a new multi-thousand dollar piece of machinery."

These same advantages can be applied to your manufacturing methods —

Ask your Bullard Sales Engineer for complete details.





THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

THE BULLARD COMPANY

286 CANFIELD AVENUE • BRIDGEPORT 9, CONNECTICUT

Please send me a copy of the

NEW MAN-AU-TROL V.T.L., MODEL 75 CATALOG

NAME .....

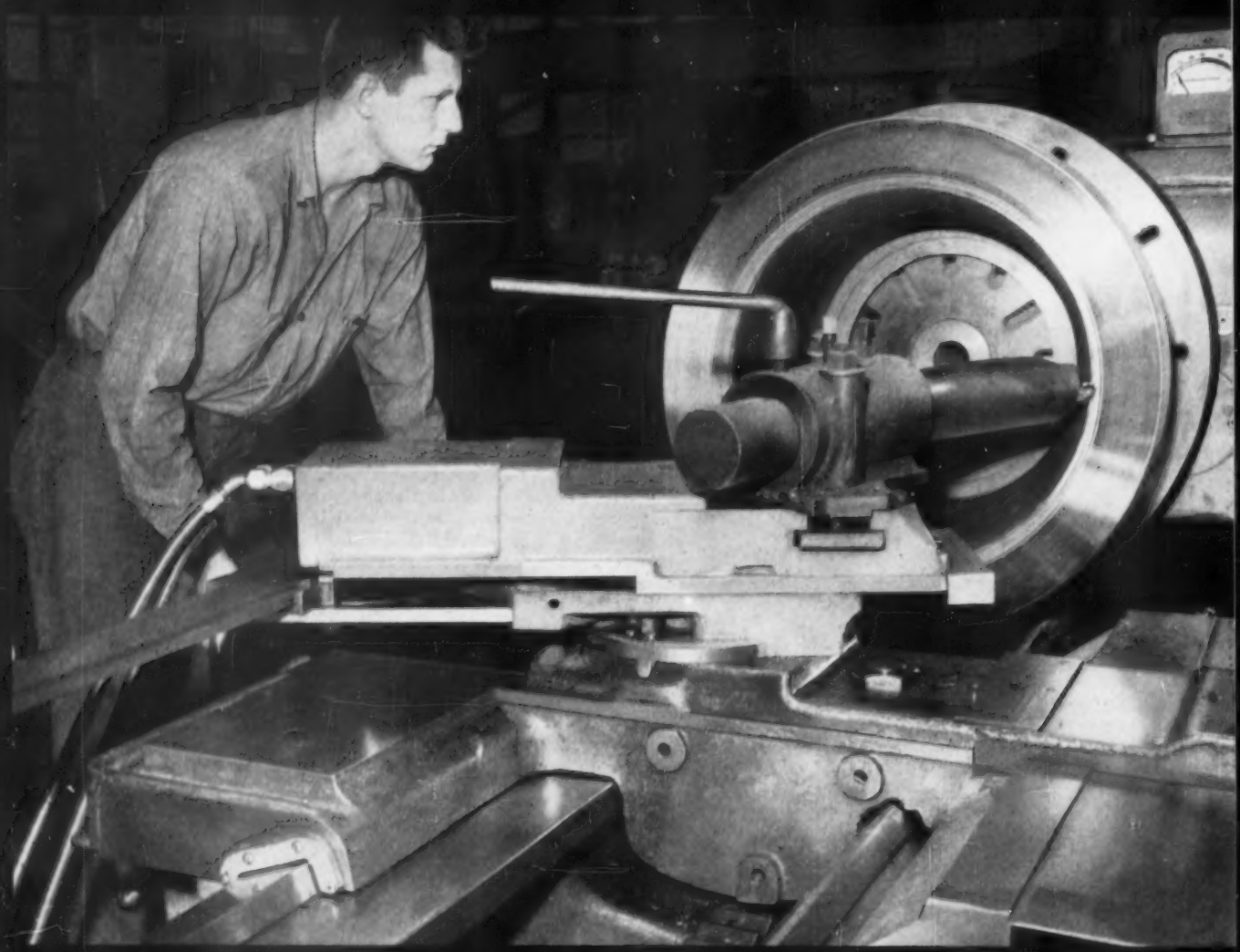
COMPANY ..... POSITION .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

before you buy a tracing lathe,

find out how economically



you can . . .

add HYDRA-TRACE* to your Present LeBlond

American Cast Iron Pipe Co. did! Now they have all the advantages of a "new" tracing lathe, at a fraction of new-lathe cost. Actually, Hydra-Trace Duplicating Attachment is quickly and easily installed on most any LeBlond Lathe built since 1935.

This tracing-boring job at American Cast Iron Pipe Co., Birmingham, Ala., is a good example of Hydra-Trace performance. Bells for centrifugal pipe molds are machined internally with Hydra-Trace feeding at 30° angle. The part is finished in one-third time required for hand-fed turning. Details of the machining operation were worked out by LeBlond engineers, who prepared prints and template pattern for American.

LeBlond offers a wide variety of useful turning attachments. Because of the inherent stamina of LeBlond machines, our customers often solve special turning problems by adding to their present machine—good for many more years of dependable service.

Perhaps you, as a LeBlond Lathe owner, have a tracing job made to order for Hydra-Trace. Our field engineers are always on call, ready to work with you in solving your specific turning problems. Write today and tell us your needs.

*Hydra-Trace (Trade Mark registered U.S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment. Can be mounted in place of compound rest on practically all LeBlond lathes built since 1935.

Simply adding HYDRA-TRACE made a tracing lathe of this five-year-old 32" LeBlond Heavy Duty—at small cost. These parts call for tracing-boring operation. Material #1025 steel; spindle speed 35 rpm; feed .016; carbide tool; finish 60 micro-inches; tolerance ±.0025. Machining time 3 hours, one-third time required for hand-fed turning.

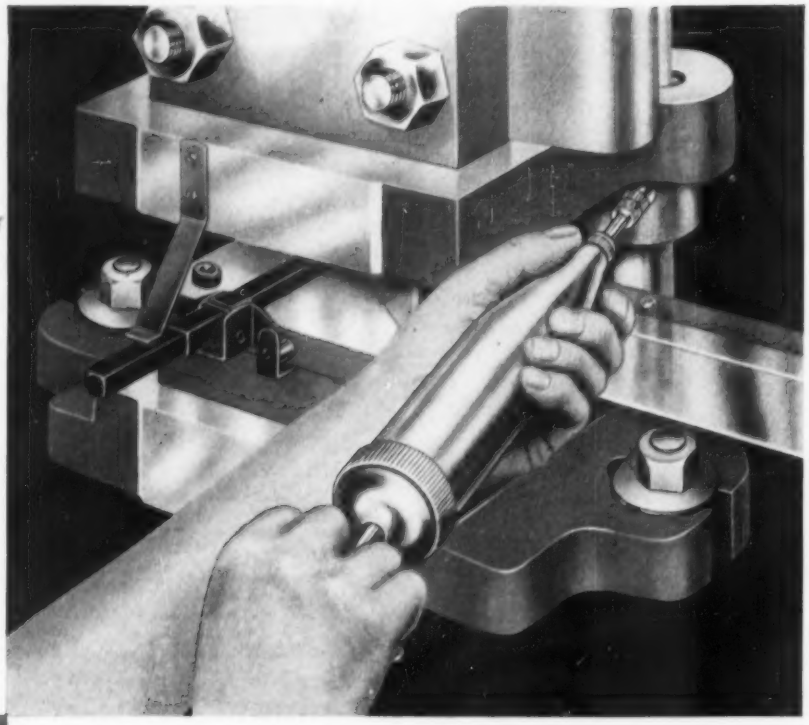
. . . cut with confidence

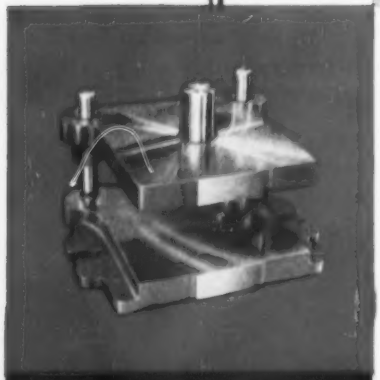
LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

World's largest builder of a complete line of lathes for more than 69 years

NEW oil lubrication system





DANLY

ON NEW DANLY DIE SETS

Here is another example of Danly leadership in die set design . . . the new oil lubrication system for guide posts and bushings. The illustration shows how easily a lubrication gun reaches the oil fitting in the shoulder of the bushing. Once injected, oil fills figure-8 oil grooves in the bushing to assure uniform lubrication for protection that lasts even through long press runs . . . less frequent oiling is needed, the job is done faster. Isn't this new lubrication system another important reason why you should specify Danly die sets?

complete new "leadership line" catalog

More than 200 pages provide you with more complete design information, easier selection of die sets and supplies. Write for your copy today!

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50 • Illinois

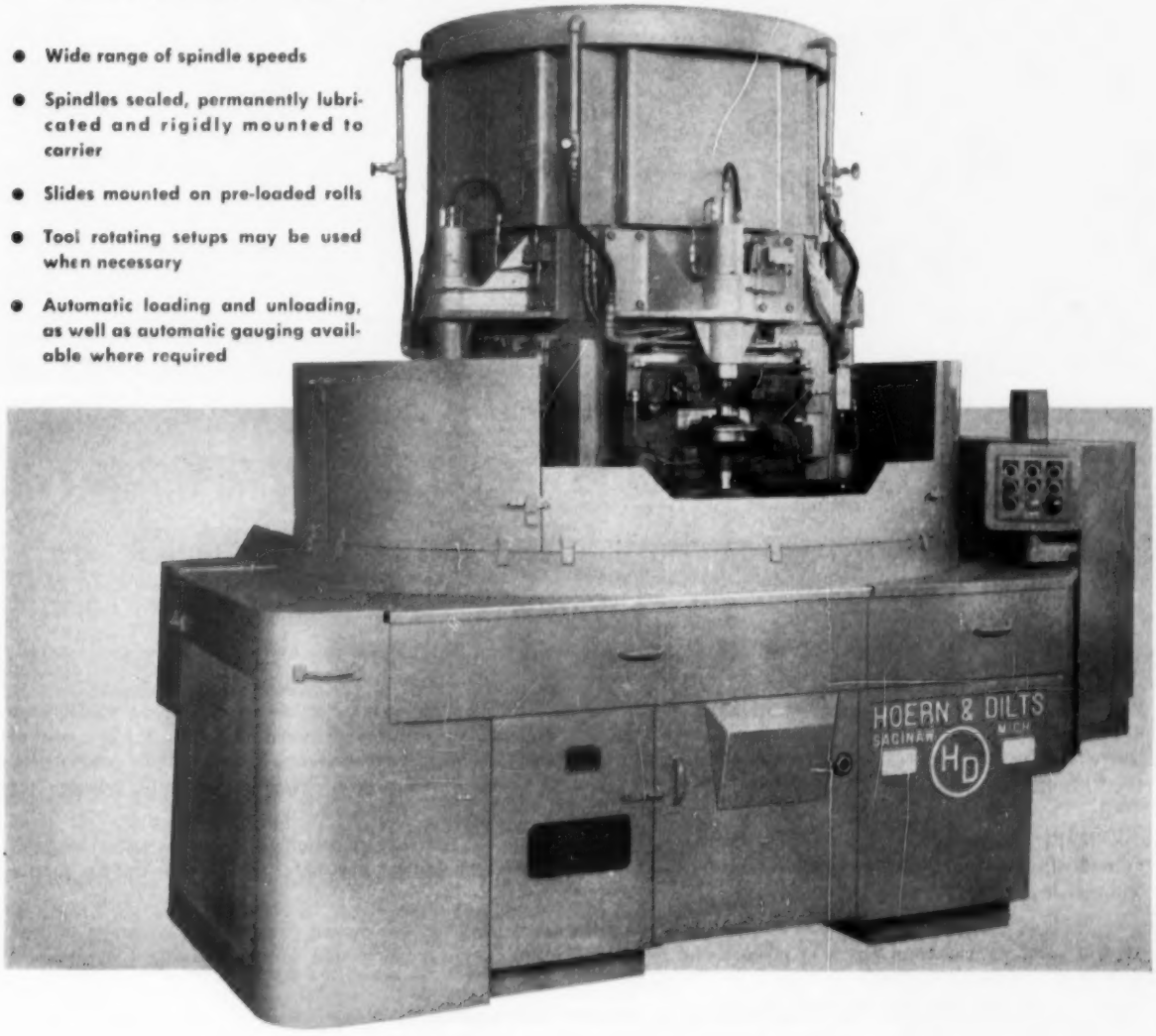
for your precision boring . . . .

5 times as many pieces every hour

Hoern & Dilts continuous boring machines have *five* sets of contour turning and boring slides, each serving one or two spindles and continuously moving around a central column. Slides and spindles travel together. Operator merely loads and unloads.

Pieces are completely turned, bored and faced in one circuit around the machine. One set of stationary cams actuating all slides provides absolute duplication of dimensions between stations.

- **Wide range of spindle speeds**
- **Spindles sealed, permanently lubricated and rigidly mounted to carrier**
- **Slides mounted on pre-loaded rolls**
- **Tool rotating setups may be used when necessary**
- **Automatic loading and unloading, as well as automatic gauging available where required**



Hoern & Dilts engineers will welcome the opportunity to cooperate with you on any high production finishing operation.

HOERN & DILTS DIVISION

The New Britain Machine Company • Saginaw, Michigan

OTHER NEW BRITAIN MACHINE TOOL DIVISIONS

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Lucas Machine Division
Cleveland, Ohio
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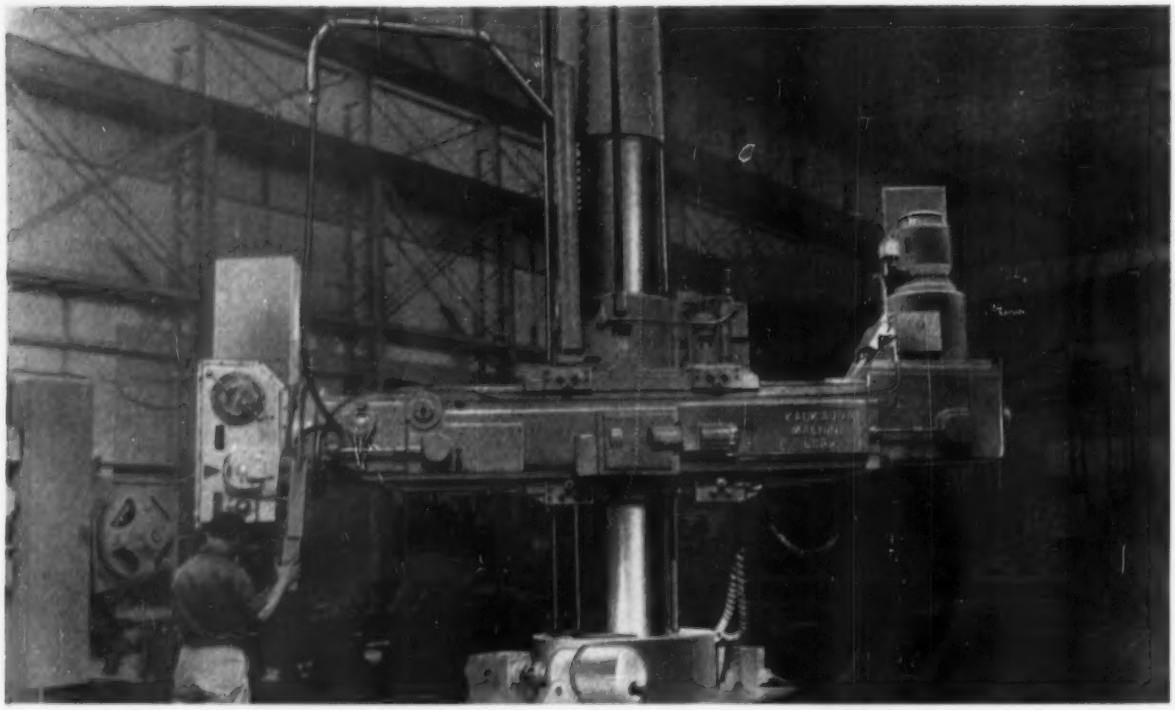


A JOB THAT ONLY A *Kaukauna* UNIVERSAL RADIAL DRILLING, TAPPING AND BORING MACHINE CAN DO—

faster, easier, at lower production cost.

HOW 2 JOBS WERE PERFORMED AT THE SAME TIME ON THE SAME PIECE to save costly positioning, material handling and machine shutdown.

A nationally known manufacturer of large automotive and aviation components ordered a Kaukauna Model 140-U Portable Universal Radial Drilling Machine to be used for drilling, tapping and reaming aircraft structure sections at a multiplicity of angles. However, tooling operations on the original setup were not completed when the machine was received, so it was put to work in conjunction with a Giddings & Lewis Horizontal Boring Machine and a power rotary table.

The workpiece was mounted on the table and at the same time that milling and boring operations were being performed with Giddings & Lewis, the Kaukauna Model 140-U performed the vertical, horizontal and angular drilling, tapping and reaming operations.

Having completed this work, this portable 4" spindle Universal Machine was moved from station to station throughout the plant by overhead crane to perform the many drilling, tapping, reaming and boring operations necessary to tool up the original program.

—AND HOW THIS LED TO THE PURCHASE OF A SECOND KAUKAUNA RADIAL.

The tool room supervisors quickly realized the great savings in time and labor made possible with the Kaukauna Universal and immediately ordered the smaller 2½" spindle Model 125-U for tool room use exclusively.

Learn now what a Kaukauna will do for you by time estimates on your various jobs.

See your nearest Kaukauna distributor, or phone, write or wire direct.

KAUKAUNA MACHINE & FOUNDRY DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
KAUKAUNA, WISCONSIN, U.S.A. TELEPHONE ROCKWELL 6-4631 CABLE KAUMACH

Exactly the Power You Need

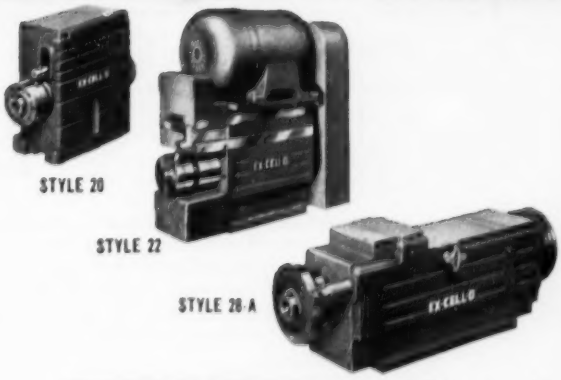
Range of horsepower, stroke, spindle speed and thrust in Ex-Cell-O Quill Type Power Units

Ex-Cell-O Hydraulic Power Units come in sizes suitable for a wide range of applications. Compact design makes it possible to place them at close center distances either in line or radially around a fixture. No matter what the application, you get smooth, dependable operation.

Used in drilling, counterboring, spot-facing and reaming operations, these hydraulic power units can be designed into special-purpose machines with easily controlled automatic cycles. Units can later be re-arranged to perform different machining operations.

You can install these power units easily. They'll stand up under fast cycles and continuous operation; they're self-lubricated.

For complete information ask your Ex-Cell-O representative or write Ex-Cell-O in Detroit.



STYLE 20

STYLE 22

STYLE 20-A

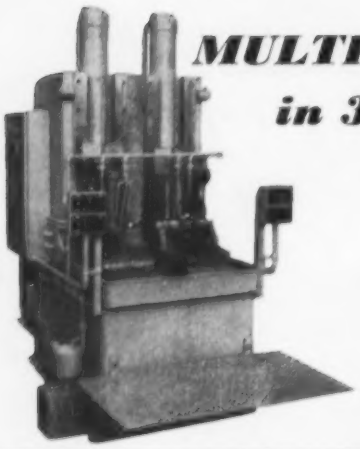
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

XLO

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

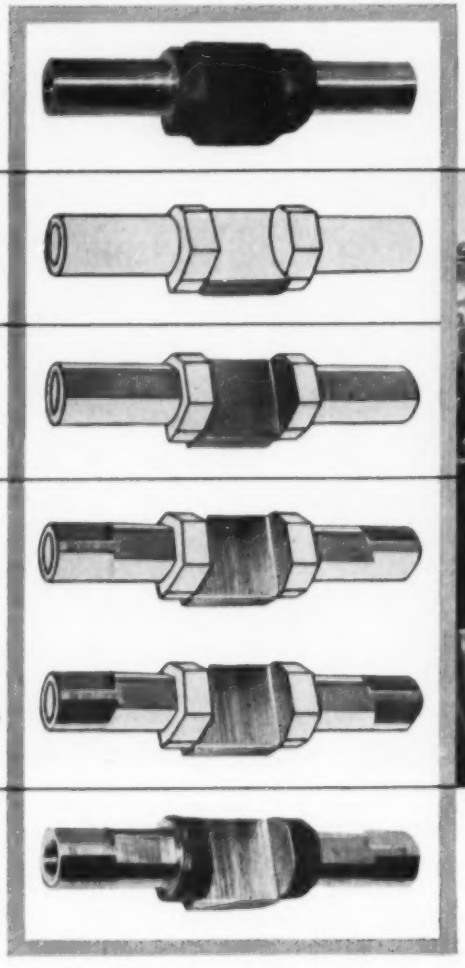
56-45



MULTIPLE SURFACES BROACHED

in 3 operations on 1 machine!

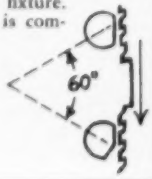
American TOOLING IS SIMPLE, EFFICIENT, ECONOMICAL

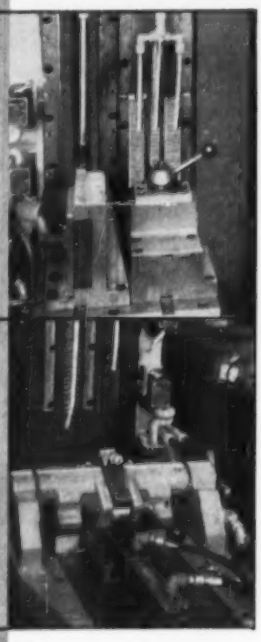


At the first of three stations on this American Dual Ram Broaching Machine, both sides of a pinion mate cross shaft are straddle broached to finished width. Sliding tables automatically move parts into broaching position and return for reloading.

Second station on the left hand ram moves part into position for simultaneous broaching of the sides and bottom of wide center slot and of the two flats on the O.D. of both ends of the shaft.

At the third station, two angular flats are broached on each end of the shaft in a single stroke of the right hand ram. Parts are clamped in a hydraulically actuated, trunnion type, work-holding fixture. As broaching of the first half is completed and a gap in the broaches is reached, fixture tilts automatically to position part for broaching the second flat.





Production:

OVER 170 PARTS PER HOUR
AT 100% EFFICIENCY

Here, a standard American broaching machine has been adapted, with relatively inexpensive tooling, to efficient, multiple operations that can be run on automatic or semi-automatic cycle. Versatility of the machine is unimpaired — it can be re-tooled easily for other purposes as later production requirements dictate.

American engineering can accomplish similar things for you. Whether your broaching needs call for relatively low cost tooling or for the highest degree of automation, American can best coordinate the design and building of the right machine, fixtures and broaches.

Write or 'phone details of your requirements. Or write for Catalog 450.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

COLD FACTS about the HOTTEST IDEA in the history of coolants...

1 **CIMCOOL**° Concentrate has become, in just a few years, the largest selling chemical cutting fluid in the world.

2 **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.

3 **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.

4 **CIMCOOL IS CLEAN,** doesn't soil hands or clothing. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

For complete details on all the advantages of CIMCOOL Standard Concentrate, consult your CIMCOOL distributor. He'll be happy to tell you all about CIMCOOL—as well as the entire family of CIMCOOL Cutting Fluids. Or contact us direct and we'll send one of our Cincinnati Milling-trained machinists to call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive** — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

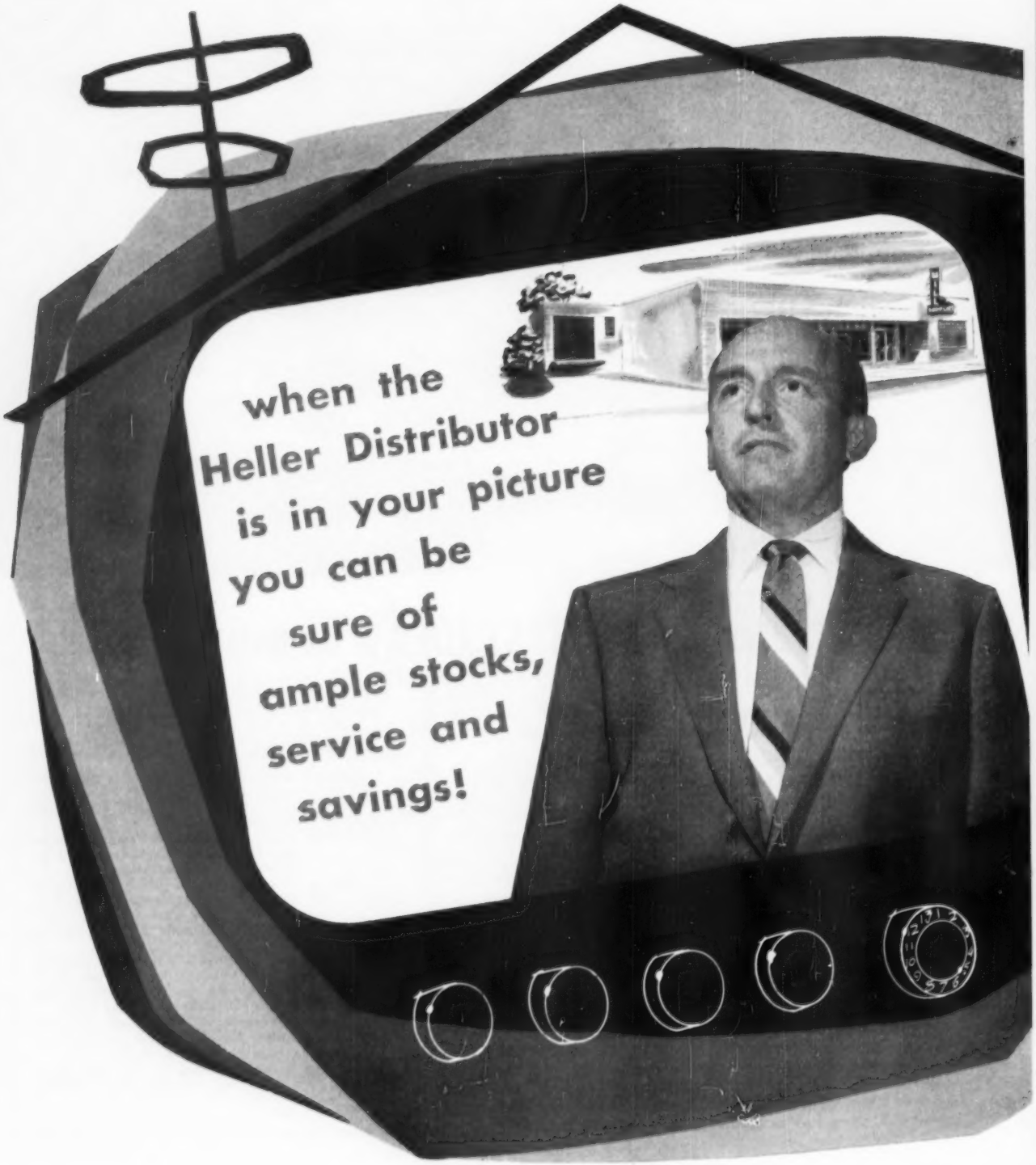
CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.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Heller Distributor
is in your picture
you can be
sure of
ample stocks,
service and
savings!

LET your local Heller Distributor take care of your file needs . . . help you with filing problems . . . simplify file purchasing and save you money.

This able, silent partner of American industry . . . and representative of America's oldest file manufacturer . . . provides these valuable and practical services:

1. **Gives delivery when you need or want it of any type of file from his own stock, making it unnecessary to tie up your capital in a large inventory of your own.**
2. **Checks your file operations to be sure you're using the right types and sizes . . . carries a reserve stock for use when you need them.**
3. **Keeps you informed on new file developments and applications that save time and cut costs.**
4. **Offers counsel of a Heller factory file engineer to survey your use of files and make recommendations that help your file dollars go farther.**
5. **Maintains an ample stock of all types of files as well as regular and special handles, accessories, hammers and tools.**
6. **Makes your file problems *his* . . . and solves them.**

The best file is by Heller, originator of the famous VIXEN Milled Curved-Tooth file, the Wavy-Teeth NUCUT American Pattern file and the Spiral-Cut Half Round file. *The best source of supply is your Industrial Supply Distributor.*

Enjoying the practical help of your Heller Distributor is as easy as tuning in your favorite television show. Call on him for ALL your file, hammer and tool needs.

HELLER TOOL CO. NEWCOMERSTOWN, OHIO

SUBSIDIARY OF SIMONDS SAW AND STEEL COMPANY

America's oldest file manufacturer

Two of America's Most Modern

22 BLISS HYDRO-DYNAMIC PRESSES WORK FOR BOTH ARMY AND NAVY AT EKCO PRODUCTS

At Ekco Products Company, Chicago, one line of Bliss presses ranging from 75 to 2500 tons produces 76 mm cartridge cases... and another line of eleven makes 3"/50 Navy cases.

The speed at which the lines are operated is "classified" information, but you may be sure it is exceptionally fast. As a matter of fact, their performance so exceeded their original "specs" that the lines have become known throughout the ordnance world.

Press operations on both lines are the same—a series of eleven steps beginning with pre-cupping a steel blank, then cup, four draws, pre-head, final draw, heading, and two tapering operations. Only difference between the Army and the Navy lines is a slight variance in tapering techniques.

Designing and building entire ordnance lines, both hydraulic and mechanical, has been a specialty of Bliss since Spanish-American War days. Today, Bliss press lines are as common throughout ordnance as they are throughout industry at large.

If you have a pressed metal problem, put this experience to work—let Bliss help you pick the one right press—or press line—for the job.

PRE-CUPPING—Army and Navy case production on each line begins with a Bliss 250-ton single-action Hydro-Dynamic press. First operation on press at right is pre-cupping flat disk blank. Blanks move from there into a second 250-ton press for cupping.

DRAWING—Third draw is made on this Bliss 125-ton press. Long punch stretches case to almost its final length. (Two more draws complete the job.) Long strokes combined with fast approach and return speeds suit this press to production of steel cases.

BLISS
SINCE 1857

is more than a name... it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

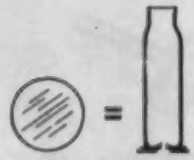
Presses, Rolling Mills, Rolls, Special Machinery

Steel Cartridge Case Lines

HYDRO BLISS DYNAMIC

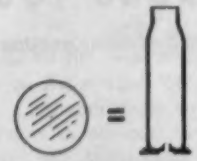
Eleven Press Operations On Each Line

ARMY



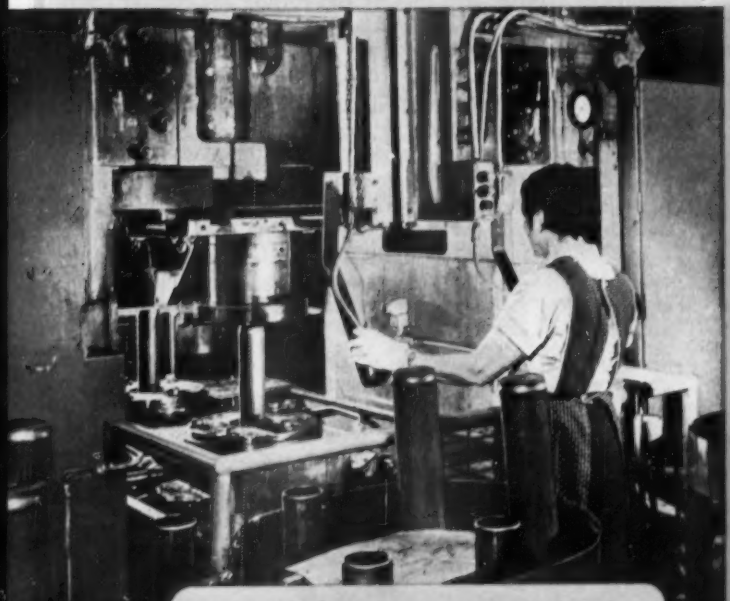
From this...to this

NAVY

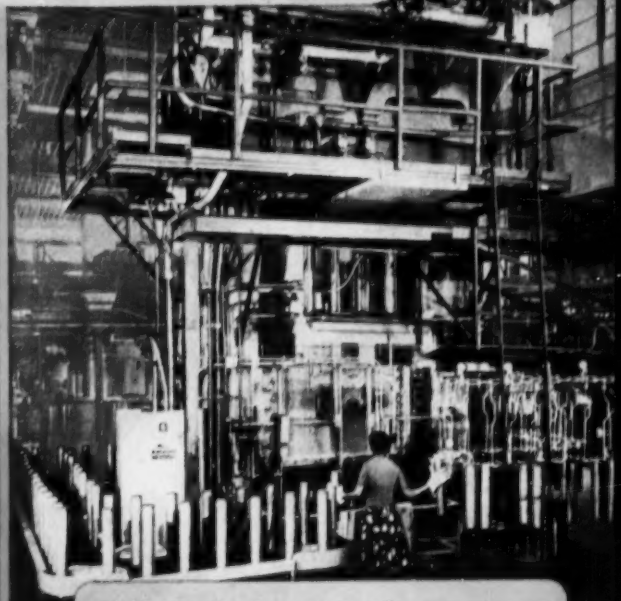


From this...to this

OPERATION	PRESS	CAPACITY
1. Pre-Cup	Bliss HS250	250
2. Cup	Bliss HS250	250
3. First Draw	Bliss HS200	200
4. Second Draw	Bliss HS150	150
5. Third Draw	Bliss HS125	125
6. Fourth Draw	Bliss HS100	100
7. Pre-Head	Bliss HS1500	1500
8. Fifth Draw	Bliss HS75	75
9. Head	Bliss HS2500	2500
10. First Taper	Bliss HS75	75
11. Second Taper	Bliss HS75	75



PRE-HEADING—This 1500-ton press, which pre-heads cases, is equipped with a Bliss-designed shuttle, allowing it to be loaded with one case while another is still in the press. Shuttle makes it easier to load and unload thus speeding production.



HEADING—Heaviest press in each line is a Bliss 2500-ton heading press. Large pumps on top provide smooth flow of high pressure oil to the slide. Pumps are simple and rugged, with peak rating well above maximum press tonnage.

U. S. Plants: Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; San Jose, California, Midland and Pittsburgh, Pa. *Branch Offices:* Boston, Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Pittsburgh, Philadelphia, Rochester, Salem, San Jose, Toledo, Washington, D. C. and Toronto, Canada; E. W. Bliss (England) Ltd., Derby, E. W. Bliss Co., (Paris), France. *Other representatives throughout the world.*

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the new additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the new "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVE. **CHICAGO 30, ILL.**

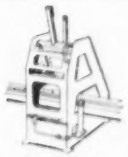
YOU GET A

Two-Fold

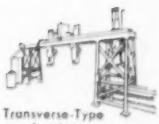
CREATIVE AUTOMATION SERVICE

AT

W. F. & JOHN BARNES



Probe-Type Inspection Machine



Transverse-Type Loader

Metal Fastener Assembly Equipment

Now to better serve your needs and help you solve automation problems quickly, Barnes offers a two-fold coordinated service.

COMPLETE PRODUCTION-LINE ENGINEERING

1 For new production line methods calling for either automatic or semi-automatic operations, you'll find at Barnes an experienced engineering staff to work with you. Detailed plans and proposals will be submitted for your consideration and can be depended upon to give you the latest in automation ideas and the very best of proven mechanical, hydraulic, and electrical actuation methods. Ask for a survey early in your planning program.

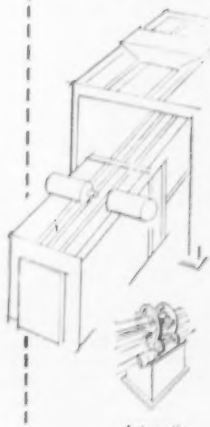
DESIGNING & BUILDING SPECIALIZED UNITS

2 The second and equally important part of Barnes two-fold service is the designing and building of specialized individual units to suit your specific needs. At Barnes you'll find a coordinated service where electrical, mechanical, hydraulic, fixture and tool engineers work together as a team. The combined efforts of a highly skilled and experienced engineering staff, coordinated with complete manufacturing facilities, help you save time by eliminating divided responsibility.

ASK FOR A METHODS ANALYSIS

Find out today why more and more Production Executives are turning to Barnes for a practical solution to their automation problems. We will be pleased to analyze your requirements, offer recommendations, and submit a cost estimate in a formal proposal if you so desire.

Casting Automatic Leak Test Machine



Automatic Roll-Over Unit

Builders of Better Machines and Equipment since 1872

W. F. & JOHN BARNES

AUTOMATION SECTION

413 S. WATER ST. • ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

finish
SQUARE HOLES
in
ONE PASS...

with
Minute Man®
SQUARE BROACHES

You can finish an *accurate* square hole in a drilled, reamed or cast bore in *one pass* in *less than one minute* with a Minute Man Square Broach.

Used in a hand-operated or hydraulic press, these High Speed Push Type broaches are ideal for putting square holes in boring bars, for jig, fixture and die work and for square coupling work.

They are available *from stock* in eight standard sizes from 1/16" square to 3/4" square.

The square holes in this tool bit holder were first drilled and tapped then finished with standard Minute Man Square Broaches at a considerable saving in time and money over previous methods.

The duMONT CORPORATION
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND [illegible] describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

Letters...

To American Machinist
330 W 42nd St, N Y 36, N Y

Models are Free

Your article on the use of models (*AM*—July 2 '56, p101) is a good and practical article, and the type of material which should be of help to your readers. We are doing the same type of planning with models, and arranging shop installation and equipment with the aid of three-dimensional layouts here in our own plant.

It would have been real nice if you had mentioned the models which we supply on free loan for this purpose. But you may not have known about them, or not have realized how widely they are used, especially by schools planning new shop installations, and by younger and smaller industries for making plant layouts. I believe that it is only in the very large industries that model makers and layout men are employed for this type of work. Usually, in the smaller industries, someone has to plan the shop layout who also has a lot of other work to do. For this reason there is not time to make three-dimensional models, but if models are available and can be borrowed on a free-loan basis, as ours can be, then the three-dimensional shop-planning method is made possible. Your readers might be interested to know that some industries do supply ready-made models, either on a free-loan or a very low-cost basis.

N D Jackman
South Bend Lathe Works
South Bend, Ind.

It Is To Laugh

In reading the copies of American Machinist we have found that the cartoons they contain are very funny and worthy of note. They suit very nicely to our way of humourism.

Ing Oscar R Acuna
Works Superintendent
Forja Argentina S A
Cordoba, Argentina

SHOPMATES

N. Jarvis

EASY··· EASY··· THAT'S IT ··· THAT'S IT!
DON'T FORCE IT··· JUST A VERY LIGHT TOUCH.
LET THE LATHE DO THE HEAVY WORK··· YOU CAN'T SQUEEZE IT DOWN WITH THE MICS!
WHAT ARE THEY TRYIN' TO DO··· GIT THAT NEW GUY THROUGH HIS APPRENTICE SHIP IN ONE DAY? THERE'S A HUNDRED YEARS EXPERIENCE THERE.
THEY DON'T CARE ABOUT HIM ··· THE WHIP MADE THEM LOAN HIM SOME TOOLS AN' THEY'RE MAKIN' SURE HE DON'T WRECK ANY OF 'EM.
N. Jarvis

SHOW THIS TO YOUR TOOLMAKER

Ask him if he doesn't agree that the Leland-Gifford No. 2LMS Toolroom Drill Press provides every feature and convenience needed in the modern toolroom for fast, accurate, effortless drilling and tapping. Developed in cooperation with leading tool engineers, this machine has won wide acceptance as the ideal drill press for general purpose toolroom use. Write for complete information.

LELAND-GIFFORD
No. 2LMS
TOOLROOM DRILL PRESS
with all these features:

1 Illuminated indicating shift with cutting speed chart.

2 Conveniently located hand wheel for changing spindle speeds and shifting back gears without stopping machine.

3 Positive stop for accurate depth adjustment.

4 Capacity of No. 2 Morse taper. No. 3 MT optional.

5 Extra large 37″ x 25″ or standard 26″ x 25″ work table.

6 26″ swing with 13″ overhang.

7 Handy push-back table raising crank and quick-acting table lock.

8 Foot switch start-stop motor control leaves operator's hand free.

9 Counterbalanced sliding head for effortless vertical adjustment.

10 Built-in light for table and work surface illumination.

11 Reversing motor control for tapping — provides manual control from feed lever or automatic control by depth stop.

12 Sensitive hand lever feed with ratchet adjustment.

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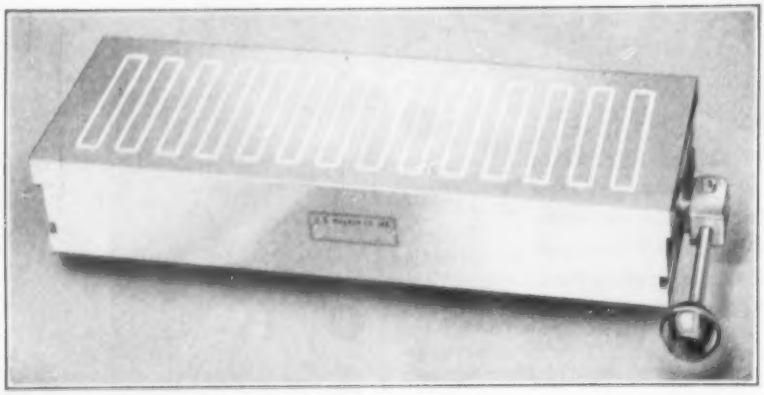
Walker Chucks
You May As Well Have the Best



Pioneer in the making of magnetic chucks, Walker engineers have the know-how to produce chucks that have the proud distinction of being the best in the world.

Walker Permanent Rectangular Chucks are made in nine standard sizes from 4" x 8" to 12" x 24" and larger for special applications.

Walker Rotary Chucks are made in nine sizes from 4" to 16" standard diameter and larger sizes such as 48" diameter, the largest in the world.

Swiveling Chucks are made in three sizes from 4" x 8" to 8" x 24".

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

PIONEERING IN MAGNETISM

The longest and broadest experience is yours when you specify a Walker Chuck, for it was nearly seventy years ago that O. S. Walker produced the first successful Magnetic Chuck. Since then, the know-how in magnetic holding devices has been evident in countless applications of rectangular, swiveling, rotary and special type chucks. And, within the last decade, the O. S. Walker Company engineers have perfected Special Vacuum Chucks to harness atmospheric force to all non-magnetic materials. The Walker line also includes, Demagnetizers, Planer Parallels, and all types of Special Magnetic Lifts.

Walker engineers, ready to help you with your holding and lifting problems, are always as near as your telephone, Worcester, Massachusetts—PL 6-6293.

Here's How

As the writer of the Diemakers Kinks, I feel that Mr. Priddy's letter (*AM*—July 16 '56, p93) is addressed to me. So here I am trying to answer the two questions.

I am sorry that I have no other answer to the first question than what Mr. Priddy gave, ie, small surface grinders and toolpost grinders. Unfortunately, I am not familiar with the high-production methods of commrcially manufactured small piercing punches. I suspect that centerless grinding must be the answer.

Referring to the second question, I have two suggestions: First, try really no-deforming (air-hardening) tool steels. There are some brands which, if correctly heat treated, have less than 0.01% dimensional variations. And such variations can be easily corrected by lapping with slightly oversize dowel pins.

If this does not appeal to you, then try the following method: Make the holes in the die plate about ⅛ to 3/16 in. larger than the dowel pins. After hardening, press fit soft tool-steel plugs into the holes, lay out the new holes, and drill and ream them properly. In this way, the possible variations due to heat treatment will not affect the holes at all.

Federico Strasser
Santiago de Chile

Help the Little Fellow

In export dealings, the United States finds itself, in many instances, in an unfavorable position as compared to European competitors, such as England and Germany. While the quality of most industrial goods manufactured in the US is as good as, or better than, anything built anywhere, this country's manufacturers and exporters lose a lot of business because we demand payment by letter of credit, while other countries allow their export customers very long term payments, up to five years. Of course, the customer pays the normal interest rate, but this allows him to pay for equipment as he uses it and as it earns its keep. England and Germany have government-sponsored banks which advance the exporter 80% of the invoice amount if the customer's credit

rating in his own country is good.

We have a similar institution here in the US, namely, the Import & Export Bank, but this is interested only in large deals with internationally known operations. The majority of European and South American industry is, however, of medium and small size. Our large exporting companies, such as General Motors, Westinghouse, General Electric, have little or no trouble in getting their export business financed. It is the small and medium-size manufacturer and exporter who finds himself in a very unfavorable position.

It would, in my opinion (and I have seen quite a bit of Europe and South America) be very advantageous if the US government would follow suit and establish a bank to cooperate with US banks and duplicate what our foreign competitors have done for years. Such an establishment should not, however, limit itself to the multimillion dollar outfits who may not even need such help, but should aid the small customer overseas and the small and medium-size manufacturers and exporters in this country.

Amounts of as little as $5000 may add up to a sizeable sum if thousands of units in that price range could be sold. There should be no repetition of some of the mistakes of our Marshall plan aid abroad, most of which went to large companies only, or to foreign-government-owned industries. This should be strictly for dealings in small and medium-size amounts.

While this problem may not seem very important in a country such as ours, which is used to billion dollar figures everywhere, it would be quite some help to small industries abroad which, under the present circumstances, cannot afford the luxury of buying American capital goods.

Frank Laurens, vice-president,
Laurens Bros, Inc
Cincinnati

Jail Bait

Why don't we do like the French shopkeepers and refuse to pay the Income Tax? If we stick together, they can't put us all in jail.

J LeFevre
Buffalo

an ACCO product

Acco Registered* Sling Chains

NEW!
Shaped Section Master Link
Holds its form under loads up to 18% greater.
NEW!
Accoloy X-Weld 125 Chain
Welds as strong or stronger than alloy material. Welded area 2¼ times conventional size area.

*Trade Mark Registered

New X-weld Chain— New Master Link

• The best has been made even better! ACCO *Registered* Sling Chains, recognized everywhere as the finest sling chains on the market, have now been made *still stronger and safer* by incorporating ACCO's great new Accoloy X-weld 125 chain and ACCO's new Shaped Section Master Link.

The Accoloy X-weld 125 chain is non-kinking. Each link has an oversize welded area with welds of full alloy strength. This means extra ruggedness and longer service life. The new Shaped Section Master Link weighs no more, but it withstands deformation under loads up to 18% greater than a conventional round section can.

Next time you buy sling chains, get ACCO *Registered* Sling Chains—they are better than ever! For full details, call your ACCO *Registered* Distributor—or write our nearest District Office.

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring on each sling
6. Signed Registry Certificate with each sling

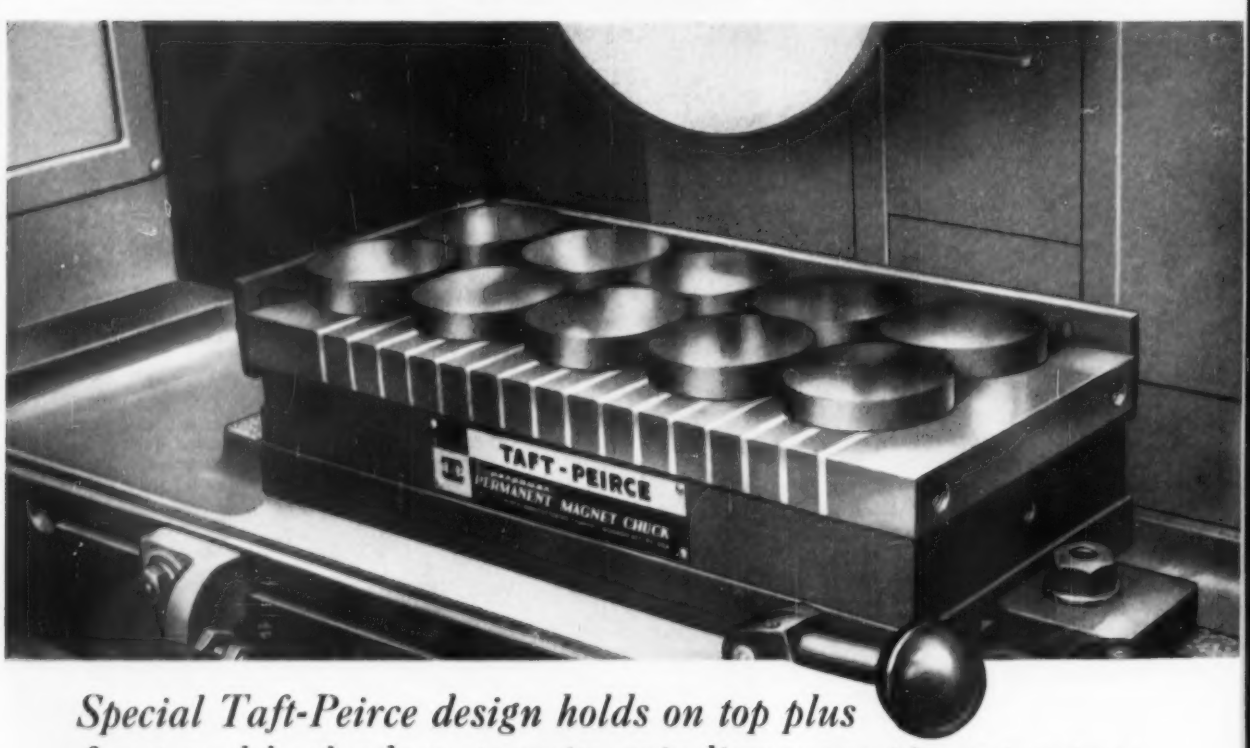
ACCO American Chain Division
AMERICAN CHAIN & CABLE

TRADE MARK

York, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

plus Rings Links Hooks

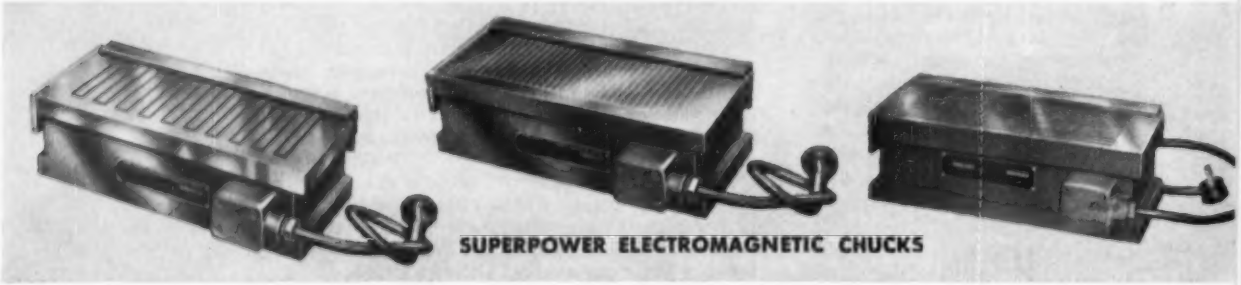
The Only Permanent Magnet Chuck



Special Taft-Peirce design holds on top plus front and back edges, permits grinding more pieces per pass

Never before have permanent magnet chucks been able to handle so many jobs! This new versatility comes from a combination of four very important design features found only in Taft-Peirce Superpower Permanent Magnet Chucks.

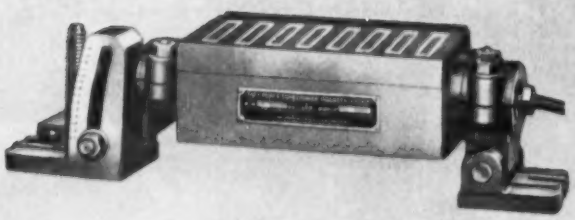
- Low height — increased clearance between wheel and chuck gives higher work capacity.
- Releases quickly in "Off" position — minimum of residual magnetism.
- More magnetic poles for its size — uniform pole spacing allows firm holding of smaller parts.
- Poles extend full width of face plate, no waste space or dead spots — increases capacity and simplifies setups.



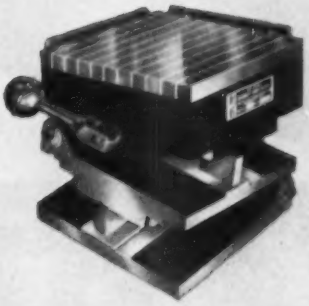
Taft-Peirce offers a wide selection of electromagnetic rectangular chucks. Key features: Extra heavy concentration of magnetic flux, greater magnetic work area, all-steel, one piece construction, sealed electrical components. Result: Maximum use of energy, more even distribution of magnetic flux. There are seventy-five standard sizes, plus a very extensive line of special patterns.

Plain Face Plate Chuck (left) is a general-purpose type, used for most chucking applications. Fine Mesh Chuck (center) has closer pole spacing, holds work of very small or thin section. Longitudinal Poles Chuck (right) holds long, narrow work firmly along entire length of piece.

with 100% All-Over Holding Power



ADJUSTABLE CHUCKS



Taft-Peirce modern chuck features are also available in several standard adjustable models designed to save setup time and insure accuracy on angular grinding jobs.

Duplex Model Electromagnetic Chuck (top illustration) is a precision grinding fixture, swivels to 90° on either side of horizontal, tilts to 14°. Clamps rigidly at any setting.

Sine Angle Permanent Magnet Chucks are available in either simple or compound (lower illustration) models. Angles from 0° to 90° are set quickly and surely with standard gage blocks. Electromagnetic models can also be furnished from stock.

Permanent Magnet Chucks are furnished in sizes from 3″ x 6″ to 10″ x 15″. Check into the amazing holding power and see how it can simplify your grinding, planing, and light milling operations. Electromagnetic Chucks range in sizes from 4″ x 8″ to 36″ x 60″. Larger chucks can be assembled from these standard Superpower units.

All types and sizes of standard Taft-Peirce Magnetic Chucks are readily available. Special chucks for unusual holding applications are designed and built on request. Write for catalog on complete line of Superpower Electromagnetic and Permanent Magnet Chucks — then make sure you . . .

Tips

ON USING MAGNETIC CHUCKS

Always position work on chuck to introduce maximum magnetic flux. Flux is dependent upon the total gap length in contact with work. Setup in Fig. 1-A will hold piece firmer than setup in Fig. 1-B

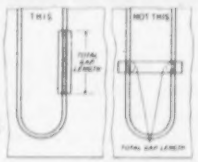
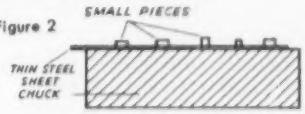


Figure 1-A Figure 1-B

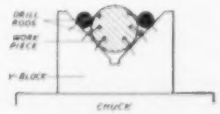
With exceptionally small pieces, place a thin steel sheet upon chuck and the small pieces on top of it, over the gaps, as in Figure 2. Steel sheet will concentrate flux through the pieces.

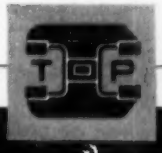
Figure 2



When holding round work in magnetic V-blocks on a chuck, more flux and holding power can be obtained by using appropriate sizes of drill rod to provide additional points of contact, as shown in Figure 3.

Figure 3





TAKE IT TO TAFT-PEIRCE

The Taft-Peirce Manufacturing Company
Woonsocket, Rhode Island

T-P Means TOP Precision

You'll Be Glad TOMORROW

NEW 46" KING
VERTICAL BORING &
TURNING MACHINE
with Turret, Ram,
Side Head, and
Coolant Pan

You Chose The New KING TODAY!

The all new KING® Vertical Boring & Turning Machines have been completely re-designed and re-engineered to take maximum advantage of new cutting tools, materials, and methods—not only those of today but those which, along foreseeable lines of development, will likely become available during the years ahead.

The result of this "forward look" is a line of machines with highly advanced features designed to bring to boring mill users the *ultimate obtainable productive capacity*—for today *and* for tomorrow.

Full Electrical Operation

ALL CONTROLS CONVENIENTLY LOCATED ON MOVABLE PENDANT AND FIXED-MOUNTED SIDE HEAD PANEL

plus

ADVANCED CONSTRUCTION AND OPERATING FEATURES:

INCREASED HORSEPOWER
40 to 50 H.P. on 30" to 46" sizes. 75 to 100 H.P. on sizes 56" and up.

EXPANDED FEED AND SPEED RANGE
24 feeds from .0016 to .250 per revolution. 24 speeds in any one of three standard ranges: low, intermediate, or high.

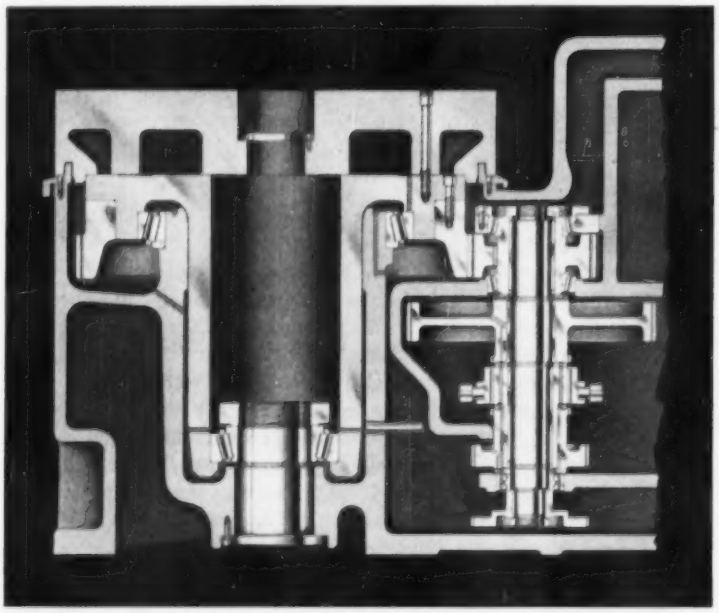
PRE-SELECTIVE FEED AND SPEED SELECTION FROM DIRECT-READING DIALS

UNIT CONSTRUCTION OF SPINDLE DRIVE
—permitting removal as a single unit for easy maintenance.

AUTOMATIC LUBRICATION OF ALL MOVING PARTS

MACHINE ADAPTED FOR OPTIONAL ADDITION OF:

- Automatic positioning of heads
- Automatic cycling
- Power rail clamping
- Power indexing of turrets
- Automatic tracing control of heads



OUTSTANDING NEW SPINDLE AND MOUNTING PROVIDES MAXIMUM TABLE STABILITY, ACCURACY

Substantially increased accuracy of spindle operation is assured by many improved construction features. As indicated in drawing above, the spindle itself is extra heavy and rigid. Tapered roller, preloaded bearings are placed so as to provide extreme stability and accuracy. Adjustment of the bearings as well as removal of the spindle assembly are quickly, easily accomplished. Helical gear spindle drive completely eliminates any tendency toward spindle deflection. The lubrication system is automatic and safety inter-locked.

For further details on the New King machine see the King Distributor in your area, or write us direct.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

Spot news...

- **They're so short of tooling people in Detroit** that Ford has "imported" 30 top tool and die men from one of its Chicago plants to help get the '57's off the ground at its Mound Road plant. They'll be there at least 30 days.
- **Imports of foreign steel have become noticeable in recent weeks**—particularly Belgian-made barbed wire, which comes through New Orleans, is distributed upriver by barge, and sells duty-paid at average U S prices.
- **A British manufacturer says it would cost him twice as much**, and take twice as long, to turn out a grinder under license than it does the U S licensor—yet the Britisher's labor costs are just about half.

Forging molybdenum in argon atmospheres has led Universal Cyclops Steel up some science-fiction roads. One possible solution to the atmosphere problem: rebuild a building so it can be argon-atmosphered, equipping operators with space suits to which air and telephone are piped. Forging equipment would be an Impacter, to avoid seal-loosening hammer vibration, and larger space requirement for a press. Because program is experimental, operators would be engineers (no union problem).

- **High steel prices may be forcing a trend to plastic refrigerators.** That, coupled with the prohibitive cost of tooling up new steel models today, has top U S refrigerator makers intensively researching ways to make all-plastic cabinets, and Westinghouse has already introduced one.
- **One auto company expects to "tailor-make" alloys** with entirely new properties. How? By chilling metals to within a few degrees of absolute zero.
- **Automobile makers will use heavier-gage steel to "beef up" roof supports** and to fabricate integrated chasis-and-frame units in 1957 models. This means, in turn, new equipment to level, process, feed and decoil the heavier steel, plus new blanking and square-shearing machinery.

Detroit is well on its way to becoming the nation's guided missile, as well as auto, capital. Some $79 million will be spent on missile output in the Detroit area, including $14 million to Utica-Bend Corp (the old Studebaker-Packard Utica engine plant) and $65 million to Chrysler for turning out its Redstone and Jupiter missiles.

- **Orders for big dies for 1958 automobile models are already showing up** in tool and die shops, which are just completing '57 model tooling.
- **"Cored forging" is now possible with aluminum.** Technique developed by Weatherhead Co for the Air Material Command turns out aluminum hollow fittings for aircraft hydraulic systems (each military plane uses about 1500) that are reportedly lighter, cheaper, longer-lasting than machined ones.
- **Automation should be designed into a production line** by production-trained engineers and supervisors, one company has learned. It had an expert machine designer do a completely automated job, which worked like a charm except that output was reduced from 8 to 3 pieces per minute.

Spot index to major News stories...

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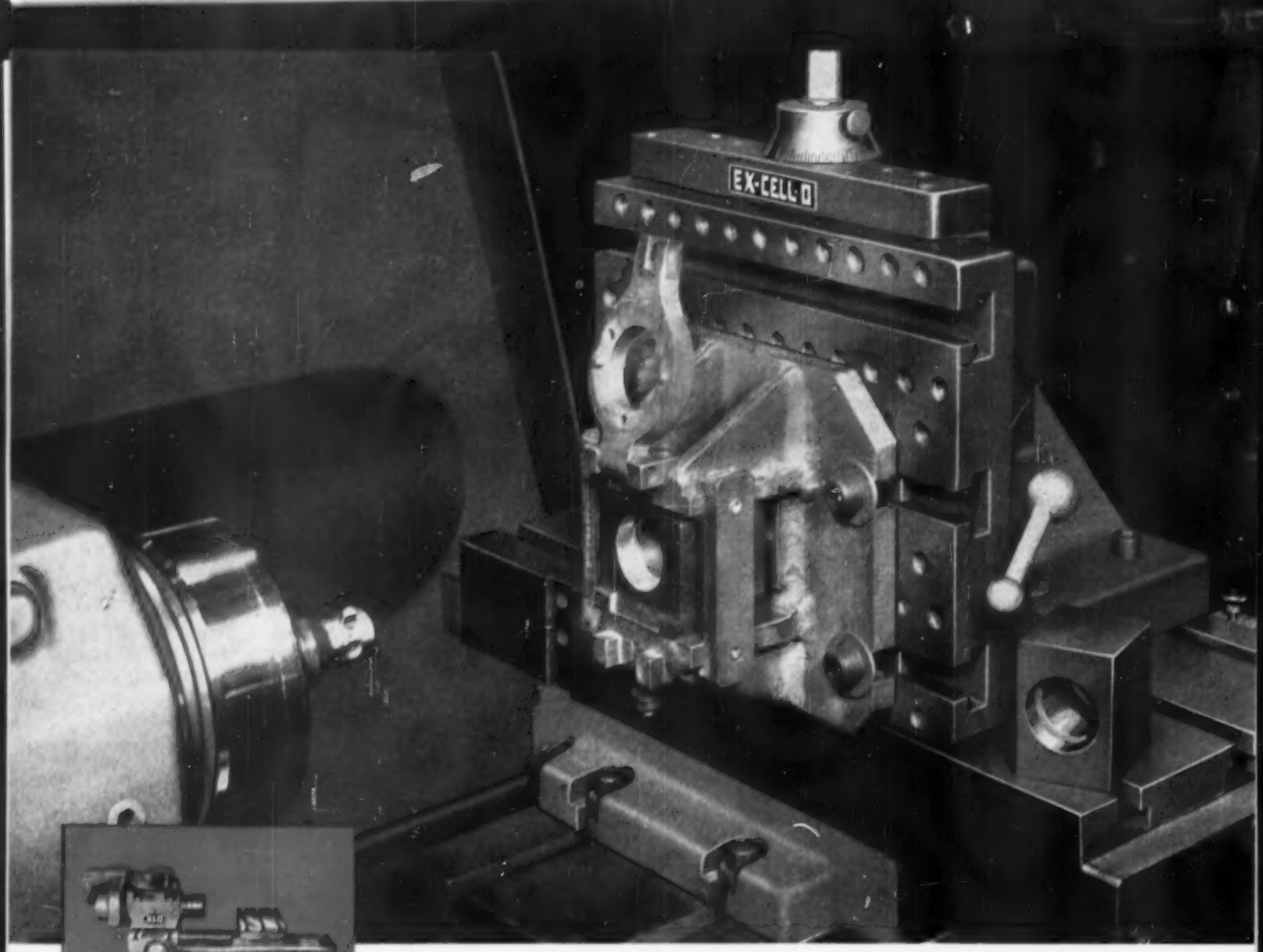

Close-up view of Ex-Cell-O Precision Boring Machine equipped with a single spindle and a universal fixture for small lot production.

2112-B single-end Ex-Cell-O Precision Boring Machine with horizontal cross slide fixture.

1212-B double-end Ex-Cell-O Precision Boring Machine with universal fixture having cross and vertical slides.

These versatile machines keep busy

Ideal machines for toolroom work and short production runs

These Ex-Cell-O Precision Boring Machines equipped for general-purpose work perform precision boring, turning, facing and chamfering operations quickly and economically.

They can be operated automatically or manually. Spindle speeds are easily changed to suit the operation. Universal fixture rigidly holds tools and work pieces of many sizes and shapes. Horizontal and vertical slides of the fixture permit precision positioning of either tools or work.

A complete line of precision boring machines is available. For information just call your Ex-Cell-O representative or write Ex-Cell-O in Detroit.

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56-51

Washington ... NEWS REPORT

Major reassessment of aid . . .

The Foreign Aid Program and the assumptions on which it's based are being subjected to a reappraisal comparable in scope to the soul-searching which led up to the original Marshall Plan. A committee headed by former U S Steel board chairman Fairless is about to study the objectives and methods of the program for President Eisenhower. The program's administrators in the State Dept are reviewing individual aid projects as part of the major policy reassessment. Inland Steel's former president Randall, now the President's Special Advisor on Foreign Economic Policy, is getting set to make new policy proposals. The two Foreign Relations Committees of Congress are reviewing long-range aid.

Reason for the massive policy re-evaluation: the nature of the challenge to U S political and economic interests has changed in the past two years; the threat—no longer military—now comes from aggressive nationalism stimulated by Soviet power and diplomacy. The new threat has raised serious doubts in Washington over the effectiveness of the Foreign Aid Program, a major tool of U S foreign policy.

It's too early to say precisely what will come out of the policy review. Election campaign politics make it unlikely that dramatic changes will be made. Right now, most observers expect that the consensus of the new proposals will be for somewhat more rather than less aid—probably in new forms, however. First, there are strategic reasons: the U S stake in maintaining its influence in under-developed nations is too huge to allow a total walkout on our part. Then there's the economics: aid expenditures are helping set up U S markets and overseas sources of supply; U S foreign investment would be hurt by dropping the aid program; aid expenditures account for 20% of total exports.

One new scheme being discussed is to finance economic development help out of a revolving, long-term, low interest loan fund to be set up from repayments of principal and interest on outstanding U S loans abroad. Another likely change is a cutback in military aid in the Far East—funds going for economic development.

New missile ships . . .

The Navy is converting two mariner-class merchant ships into Naval "launching platforms" for the Jupiter Intermediate-Range Ballistic Missile. Some observers take this to mean that development of the 1500-mile IRBM may be closer at hand than Washington has revealed up to now.

Jupiter is being developed as a joint Army-Navy project at the Army's Redstone Ordnance Arsenal, Huntsville, Ala. Chrysler Corp, which is producing the shorter-range Redstone Ballistic Missile for the Army, has been lined up to produce the Jupiter, too.

Jupiter is only one of four top-priority ballistic missile projects. The others—all Air Force: Douglas Aircraft's Thor IRBM, Convair's Atlas and Glenn L Martin's Titan ICBMs.

The two merchant ships are being converted at the Navy's yards in New York and Norfolk. Earlier, there had been talk that the Navy would convert battleships into IRBM launching platforms. The mariner-class is the biggest (13,000 tons) and fastest (20 knots) U S cargo ship. The government built 35 of these vessels four years ago, partly to take up the slack in idle private shipyards, at a cost of $8.5 million each. Five were assigned to the Navy, most of the remainder have been sold to private shipping companies for $4.5 million each.

EX-IM money for German steel . . .

The Export-Import Bank has made a $10-million loan to August Thyssen-Huette A G, a leading West German steel producer. The Germans are now dickering with about eight U S firms to use the funds for purchase of a semi-continuous billet mill, an additional bar mill for production of light structural shapes, auxiliary equipment for a cold roll mill (including tandem and temper mills), an electrolytic tinning line coupled with electrolytic cleaning installation, two shearing lines, and an additional galvanizing line.

The loan runs 15 years at 5% interest. The German company was unable to obtain financing at home (where interest rates run at 9%) or from private sources in the U S.

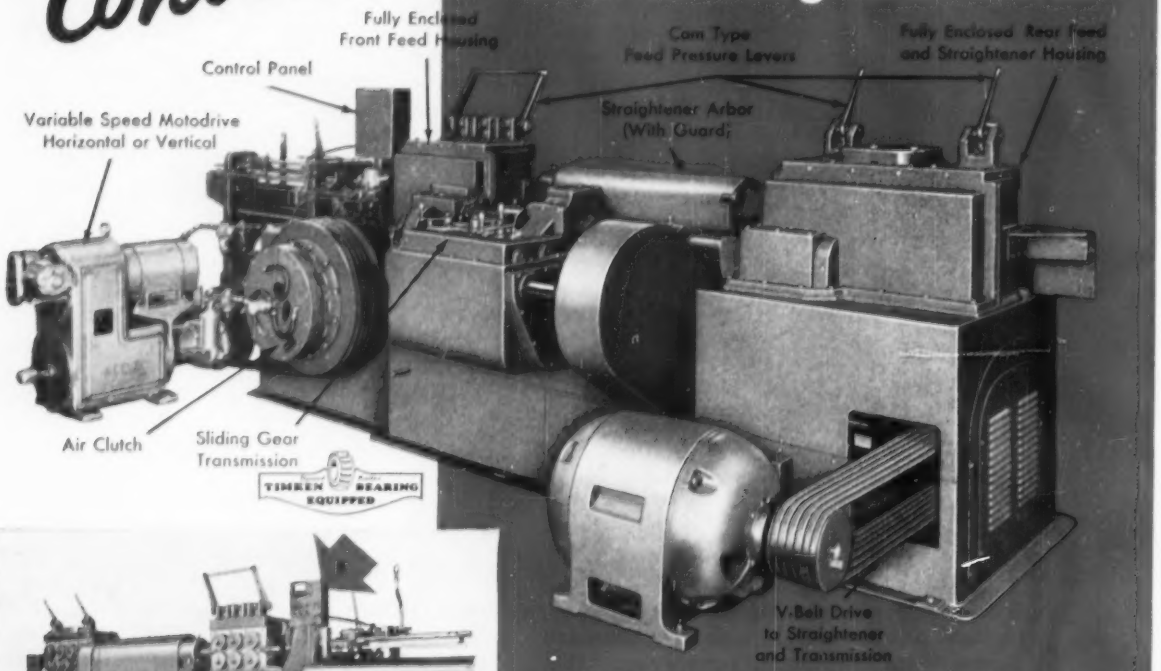
Metalworking jobless up . . .

In a rather rosy picture of employment trends painted by new Labor Department statistics on U S jobless workers, factory workers—including the metal, machinery, and transportation equipment categories—show up worst off.

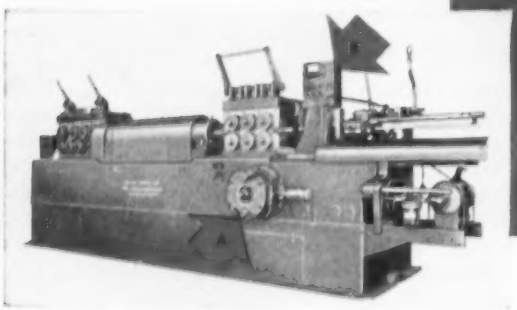
For example, while overall unemployment dropped from 1.4 million to less than 1.2 million in the first six months of this year, the only categories to show higher rates of unemployment were these—primary metal workers, metal products fabricators, machinery workers, and transportation equipment workers. In this group there were 251,400 jobless in January, 296,800 in June. Main reasons: auto layoffs, steel strike.

Better Quality Control ✳

LEWIS introduces the Air Clutch on wire straightening and cutting machines


Fully Enclosed Front Feed Housing
Control Panel
Variable Speed Motodrive Horizontal or Vertical
Air Clutch
Sliding Gear Transmission
TIMKEN BEARING EQUIPPED
Cam Type Feed Pressure Levers
Straightener Arbor (With Guard)
Fully Enclosed Rear Feed and Straightener Housing
V-Belt Drive to Straightener and Transmission

No. 11-F Travel-Cut with Flying-Shear Cut-off. Capacity ⅛" to ¾" diameter. 75-135 feet per minute. Rear view (above) with guards removed showing air clutch and drive.



Front view of No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake "A" (with guard removed) and operating panel "B" with push-button controls for Air Clutch, Reeves Motodrive and flywheel speed Indicator Tachometer.

● Lewis engineers have added three important improvements to their famous Travel-Cut Machines for BETTER QUALITY CONTROL . . . These machines are already in service in America's leading steel and wire mills.

✳ Wichita Air Clutch permits higher cut-off speeds, eliminates shock of conventional clutch. No adjustment necessary . . . automatically compensates for wear.

✳ Wichita Air Brake eliminates conventional mechanical drag brake and is only engaged for a short portion of the cut-off cycle.

✳ Reeves Variable Speed Motodrive permits infinite adjustment of flywheel speed for perfect synchronization of the cut-off and wire feed speeds. This unique arrangement makes possible the cutting of rod WITHOUT SPOT SWELL . . . allows finer adjustment for cutting short lengths. Dial tachometer registers flywheel speed.

There are Standard Lewis Travel-Cut or Stationary-Cut Machines designed to straighten and cut all materials and shapes in wire or rod from .012" to ¾" at a wide range of feed speeds.

Air Clutch available on all Travel-Cut Models. Send for new brochure showing complete line of Lewis Wire Straightening and Cutting Machines.

See our Air Clutch equipped machine in operation at the Metal Show, Cleveland, Oct. 8-12, Booth No. 2002

LEWIS MACHINE COMPANY 3440 East 76th Street Cleveland 27, Ohio

Detroit ... NEWS REPORT

Free pistons vs gas turbines . . .

There's an all-out hassle going on in Detroit these days over what's going to succeed the reciprocating engine in the future—the gas turbine or the free-piston engine?

You'll find plenty of research brass on both sides. The gas-turbine people are pretty adamant. There's nothing like it, they say. The free-piston people, on the other hand, are a bit more tolerant of other types. "There's room for all three types of propulsion," they say—and they can't see any reason to banish today's old standby gasoline engines from the auto world forever.

A lot of new things are happening in the free-piston field. In the last six months or so, the driving turbine has been moved from the rear axle to the engine compartment. And the major difficulty in driving oil and water pumps, fans and generators has been overcome by running a stub shaft out of the reduction gear box, located at the turbine.

But unsolved as yet is one of the really big problems the free-piston adherents are up against: how do you cut down on its enormous appetite for clinically clean air?

None of the filters used on automobiles today comes within a city block of providing the free-piston engine with enough clean air to do its job. Only way to do it is to make the filter nearly as big as the engine itself.

Very probably the auto industry will look for help to some sort of precipitron—one that charges incoming dirt particles with electricity, then traps them on a filter screen charged with opposite polarity.

Such precipitrons now exist for cleaning the air in a room, but they're pretty fair-sized and they cost $150 and up. What the auto industry needs is one that's not more than twice as big as present air filters, that can be run on a 12-volt battery, that will screen out all dirt larger than 5 microns, and most important of all, that will sell for about $15.

Biggest hope for the free-piston engine seems to lie in the field of economics. For one thing, tooling expenditures for a free-piston production line wouldn't exceed the amount normally needed to introduce any new engine.

The same boring and honing machinery could be used. Although no wristpin or bearings would be needed, the same pistons and piston rings would be necessary to the free-piston engine. Not only that, the industry wouldn't have to have new manufacturing techniques, as in the case of the gas turbine, and it wouldn't need to retrain its personnel.

Engines could be smaller than they are today.

And free-piston experts say that the thermal efficiency of a free-piston engine, running on low-cetane diesel fuel, would be very much better than that of either the reciprocating engine or the gas turbine.

Not only that, the entire free-piston engine, with the exception of one gear and two toothed racks made of steel, could be cast iron—another potent cost factor.

Chrysler's crisis . . .

In an effort to get a bigger market wedge, Chrysler Corporation plans to put a whole new set of "productivity standards" into effect with the '57 model year.

Translated, that means Chrysler is paring costs to the bone, adopting efficiency-expert methods. It's been tried before by Chrysler—in isolated plants. And each time it has resulted in an immediate wildcat strike against the plant. That means the storm signals are up, particularly when Chrysler will, according to one of that corporation's spokesmen, try out its new productivity scheme in a "revolutionary manner, not an evolutionary manner."

Chrysler means to go through with the scheme come hell or high water. As one official puts it, "We've got to up productivity or go the way of Studebaker-Packard."

In yet another efficiency move, Chrysler so far this year has laid out a cool $10 million for plastic dies for body work and preliminary framing. So far, it's been "very satisfactory" and the program will be continued on the '58 model runs.

Tooling for '58 . . .

You'll see considerable activity in the tooling markets when orders for the 1958 model changes come along. For instance, Lincoln will shift to a unitized body for that year.

At the same time, Ford will introduce the much-talked-about "E" series of cars in the fall of 1957. Another of the luxury cars slated for 1958 has been facelifted in its prototype models to a new low in ground-hugging.

It's a funny thing—facelifts have become so extensive in the last year that even a facelift year (and '58 will be one) means big spending in the tooling marts. That's why auto people prophesy 1958 will be a top tooling year.

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All machine functions within easy reach. All-electric, automatic controls built to conform with J. I. C. standards.

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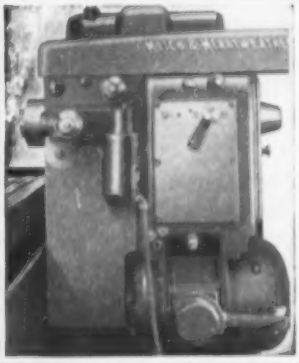
25 Hp. Anti-Friction Spindle Drive

Heavy duty milling head driven by large bull gear through involute spline. Extra wide bearing surface in housing when quill is fully extended.

. . . for QUICK, QUIET OPERATION



Hardened, ground gearing. Helical change gears for quick speed selections. Automatic spindle stop. 2-way automatic table cycles.

All the features of Mill-M-Matic point up to high, accurate production. A fresh approach employing control by electric-mechanical powered action opens new possibilities in long life and precision operation in the field of *production milling*. Our 10-page bulletin describes all the advantages found in Mill-M-Matic.

The

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Machinery Co.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Machine tools ... NEWS REPORT

Big inflow of orders ...

Many machine tool builders report a heavy inflow of orders. Much of the business has stemmed from price increases, with users getting their orders in at the old prices before the new schedules took effect.

An expected drop-off in sales hit numerous builders after the new prices actually became operative. In such cases, the volume again is working its way up and the outlook is good.

It is not unusual to find builders of standard machines with backlogs of 4 to 5 months, and builders of specials with a year's or more.

The consensus is that new orders will be very good well into 1957.

Meanwhile builders are working overtime, with most companies running 45 to 50 hours on two shifts. Some builders are operating on a workweek of 55 hr.

At least one prominent builder privately expresses the opinion that he will be running a sizable third shift the next two years.

The best part about the current situation is that business is pouring in from a variety of sources. Companies making tractors and other construction machinery, for one, are in the market.

Detroit to spend for cost saving ...

While Detroit seems to have come pretty near the end of its cycle of new-engine tooling programs, and there is a marked absence of big programs of any kind at the moment, automobile companies will be important buyers in the weeks ahead.

Take Oldsmobile. Its 50% production expansion program is about completed. But cost reduction is a major worry; and machine tool buying from here on will be based on that factor.

Truth is that Oldsmobile's management is upset because many machine tools required for cost-reduction purposes are quoted on an 18-months' delivery schedule. Olds has lifted its capacity from 105 to 150 cars per hr by balancing its production around a new 1200-ft engine line.

"Built-in versatility" is aid ...

If a company is considering diversifying its products, it should take advantage of the "built-in" versatility of the modern machine tools in its own plant, Thomas R Rudel, president Rudel Machinery Co Inc, New York, told a National Metal Trades Association conference recently. "Careful examination of existing tooling will show in many cases that it is flexible and versatile enough to be adjusted and adapted to many new product uses, with comparatively modest investment for new components, fixtures and accessories."

Mr Rudel urged managements considering diversification to consult with representatives of tool builders, with plant tool engineers and with machine tool supervisors.

"No matter how attractive the market for a new product may look," he said, "no well-managed company leaps into a situation in which it can't manufacture the additional product at a profit, with something reasonably close to its present labor force, tools and plant facilities."

Sir Alfred at 90 ...

Sir Alfred Herbert, chairman and managing director of Alfred Herbert Ltd, Coventry, England, and world-famed machine tool builder, recently celebrated his ninetieth birthday. He still takes an active part in the company which he founded 67 years ago.

His company grew up in Coventry alongside the bicycle industry for which it made machine tools. Its first machine was a polishing lathe.

Sir Alfred's sales agency for U S machine tools began as the result of his having answered an advertisement he saw in AMERICAN MACHINIST from the Lodge & Davis Machine Tool Co.

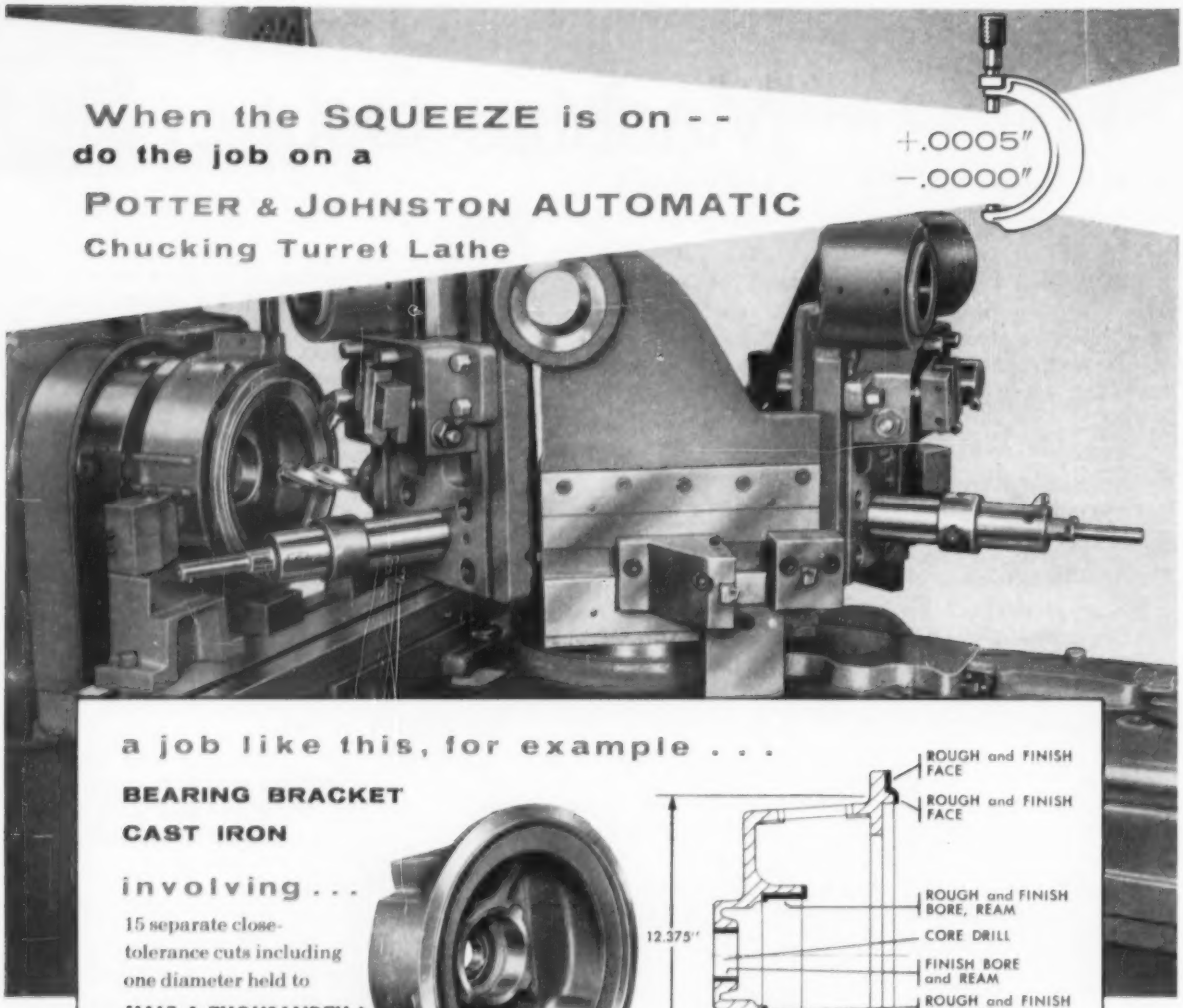
For the first 15 years of its life, Sir Alfred was president of the Machine Tool Trades Association of Great Britain.

India may build European tools ...

Oerlikon's partnership with the government of India in New Delhi's $9 million machine tool building plant at Jallahalli, South India, has been terminated. Oerlikon had a 10% interest. The Swiss company will remain as technical consultants to the government.

An Indian delegation has been visiting western European machine tool builders to negotiate manufacture of their machines under license at the Hindustan machine tool plant at Bangalore. Production of lathes began at this plant last October. The plant is operated by a private company—Hindustan Machine Tools Ltd.

When the SQUEEZE is on - -
do the job on a
POTTER & JOHNSTON AUTOMATIC
Chucking Turret Lathe



a job like this, for example . . .

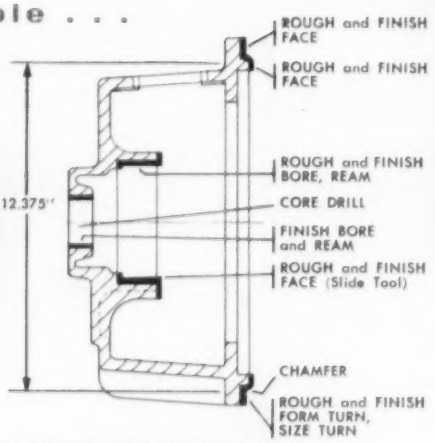
BEARING BRACKET
CAST IRON

involving . . .

15 separate close-tolerance cuts including one diameter held to

HALF A THOUSANDTH !

was finish machined - -



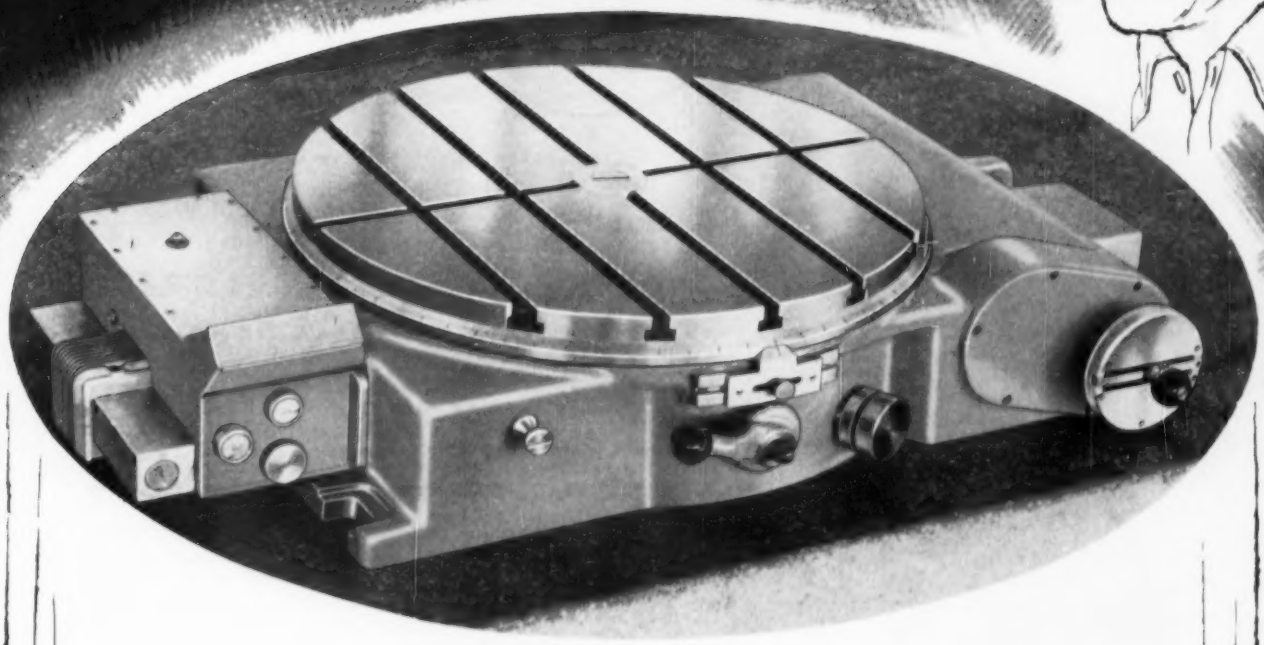
In just 4.31 minutes on a
P&J 5-DELX AUTOMATIX with P&J-ENGINEERED TOOLING

More and more jobs are calling for really close tolerances and fine finishes *plus* far faster production rates. Yes – today's higher standards mean the squeeze is on most of the time; these days you're expected to handle, as routine, jobs that were considered "specials" only a couple of years ago. There's just one way to beat the squeeze . . . profitably! Re-equip with Potter & Johnston Automatics that have the extra speed, power rigidity and versatility it takes to produce faster, more accurately and more economically. And team the machine with P&J-Engineered Tooling that takes full advantage of combined cuts and faster-biting carbide tools to reduce machining time to a minimum.

Write for literature or phone the Pratt & Whitney Office near you, and ask a Direct-Factory Representative to call and discuss your requirements. Potter & Johnston Company, Pawtucket, Rhode Island (Subsidiary of Pratt & Whitney Company, Inc.)

POTTER & JOHNSTON
Precision Production Tooling for More Than Fifty Years
AUTOMATIC CHUCKING TURRET LATHES

NO SECOND GUESSING
when you set THIS table . . .



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FACTS

about

NEW DEPARTURE
BALL BEARINGS

Self-sealed bearings simplify design . . . cut maintenance costs

New Departure originated self-sealed ball bearings to eliminate the most common causes of bearing wear and failure—such as abrasive dirt and improper lubrication. Since then, more than 300,000,000 New Departure sealed bearings have been produced in various types to fit the specific requirements of industry. Seals are available to keep out foreign matter, ranging from dust and dirt to corrosive gases . . . to retain lubricants, varying from heavy grease to light oil . . . to provide the protection that assures longest life.

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What's ahead ... in Metalworking

NEWS REPORT

New peacetime output record this fall?

Metalworking production has a good chance in the fourth quarter to match its performance in the same quarter of 1955, when a peacetime peak was reached.

It is even possible that the October-December period may establish a new peacetime record.

The summer months have been better than anticipated. Operations defied the usual seasonal influences, going up instead of down. Not much up, to be sure, but a little. And that is remarkable in itself.

The capital goods industries will lead the production parade in the final quarter. There is scarcely a heavy-goods line that will not be running overtime hours, mostly on two shifts.

Strong support will come from the automobile people who have been dragging their feet badly lately. They expect to be going full tilt by next month.

Auto parts makers have big schedules ...

The tip-off comes from the auto parts people who recently have got heavy releases from Detroit. They are gradually stepping up production until by October 1st they will be at or near full capacity and will stay there at least until the end of the year.

Some parts makers, in fact, foresee a high volume of business right through the next six to nine months.

Aviation parts manufacturers are entering a period of great activity, which promises to stretch over a substantial portion of 1957, if not all of it.

Plane builders too are practically at a peacetime peak level and should stay there a while.

Steel demand booming ...

What's happening in steel is perhaps the best index as to what's happening in Metalworking.

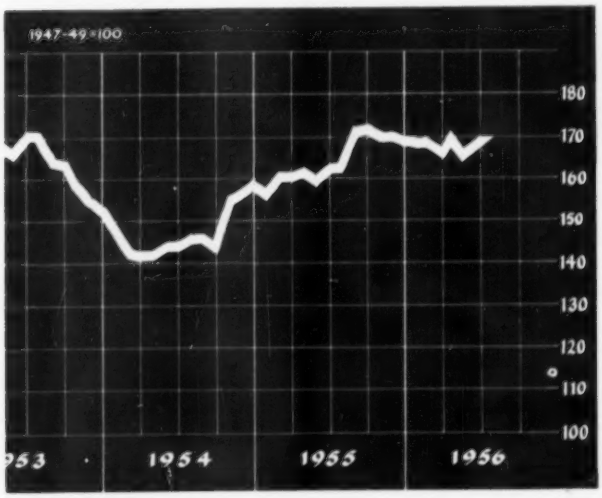
Steel mill operations are back at rated capacity or more, now that they have fully recovered from the strike. Hot rolled bars and sheet have been put on the "scarce-items" list, along with plate and structurals.

On certain very short items, some mills are dropping out of the market for the next month or two. They are swamped with business.

There will be no easing of the situation in some scarce items until well into next year. And steel companies say that they probably will not open their books to receive first-quarter orders until December 1st.

Tonnage releases from Detroit have been on the piddling side up to now. When they do come through in volume, all steel mill bookings for the desired items will be filled to overflowing for fourth quarter.

There are some areas, however, in which steel supply is catching up with demand. Galvanized sheet is a case in point. Merchant wire products have hit a seasonal skid as expected. But industrial wire orders continue heavy.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUGUST Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**171**	**171**	**168**	**167**
Machinery	**151**	**149**	**138**	
Electrical Machinery	**212**	**205**	**197**	
Autos	**110**	**110**	**147**	
Other Transportation	**333**	**333**	**298**	
Other Metalworking	**141**	**138**	**138**	

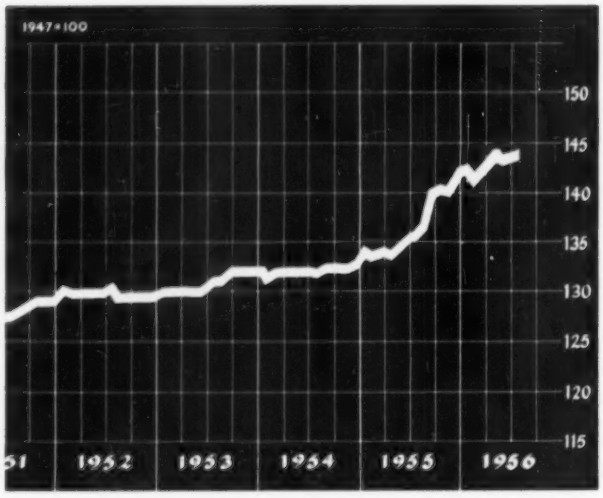
NEWS REPORT

What's ahead...in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	AUGUST Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**144.5**	**144.2**	**144.0**	**135.8**
Metalworking Machinery	165.8	165.8	155.4	
Other Machinery exc. Electrical	151.4	150.9	140.3	
Electrical Machinery	143.2	143.2	131.9	
Fabricated Metal Products	137.5	137.5	131.5	

144.5



Now that Labor Day's been and gone . . . Boom!

The wheels of business always turn faster in the fall. And judging from all the indications, this year is no exception. In fact, business is picking up much more than usual.

One of the surest signs of a business pickup is a bellwether rise in capital spending for new plant and equipment. New Commerce Department figures show that U S business will spend at an annual rate of $38 billion for capital goods in the fourth quarter. This is $6.5 billion ahead of fourth quarter 1955's annual rate.

When the total figures are in for 1956, business will have spent $35 billion on new plant and equipment. That's a tremendous record when you consider 1955's then-all-time-high of $28.7 billion was absolutely unprecedented.

With more people working today than ever before—66.8 million of us—consumer incomes are on the rise. And so is spending. High incomes and high spending are giving a big lift to sales of consumer hard goods. This will be pointed up by zooming sales of the upcoming 1957 automobiles, following a disastrous '56 year.

A lot of other industries will go along with the fourth quarter boom, too—government spending on agriculture, road building and the military, and on guided missiles will provide the lift.

An indicator of the economy's strength: it only took steel manufacturers two weeks to get back into full operation after the month-long strike.

It all adds up to big business for the next few months, at least, enough that Gross National Product will reach a $419 billion annual rate this quarter, compared with 1955's $402 billion.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	146.5	146.0	138.6
Steel ingot production (thousand tons)	2,463	2,429	2,309
Electric power output (million Kilowatt hours)	10,955	11,565	10,706
Production of automobiles and trucks	66,573	77,438	98,546
Engineering construction awards (Eng. News-Record, millions)	$372.5	$243.9	$381.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	332	335	323
Vacuum cleaners sales (thousands of units)	260	248	208
Washers sales (thousands of units)	379	340	246
Household electric ranges sales (thousands of units)	80	85	87
Radio production (thousands of units)	N.A.	1,073	718
Television production (thousands of units)	N.A.	553	344
Gear sales index (1947-49=100)	286.7	245.4	201.7
Foundry equipment new orders index (shipments, 1947-49=100)	110.3	156.7	213.8

* Seasonally adjusted
N.A. Not available

BURGMASTER® 6-Spindle Turret Drill

increases production **200%** at J. & S. Carburetor Co., Dallas

Here is a "before and after" story which indicates Burgmaster's great ability to increase production, save time, reduce operator fatigue, and improve accuracy and quality of work.

This experience is one of many. If you have a job requiring multiple operations (drilling, reaming, tapping, counter-boring, etc.), this can be accomplished in one setup, with one operator, automatically with a Burgmaster.

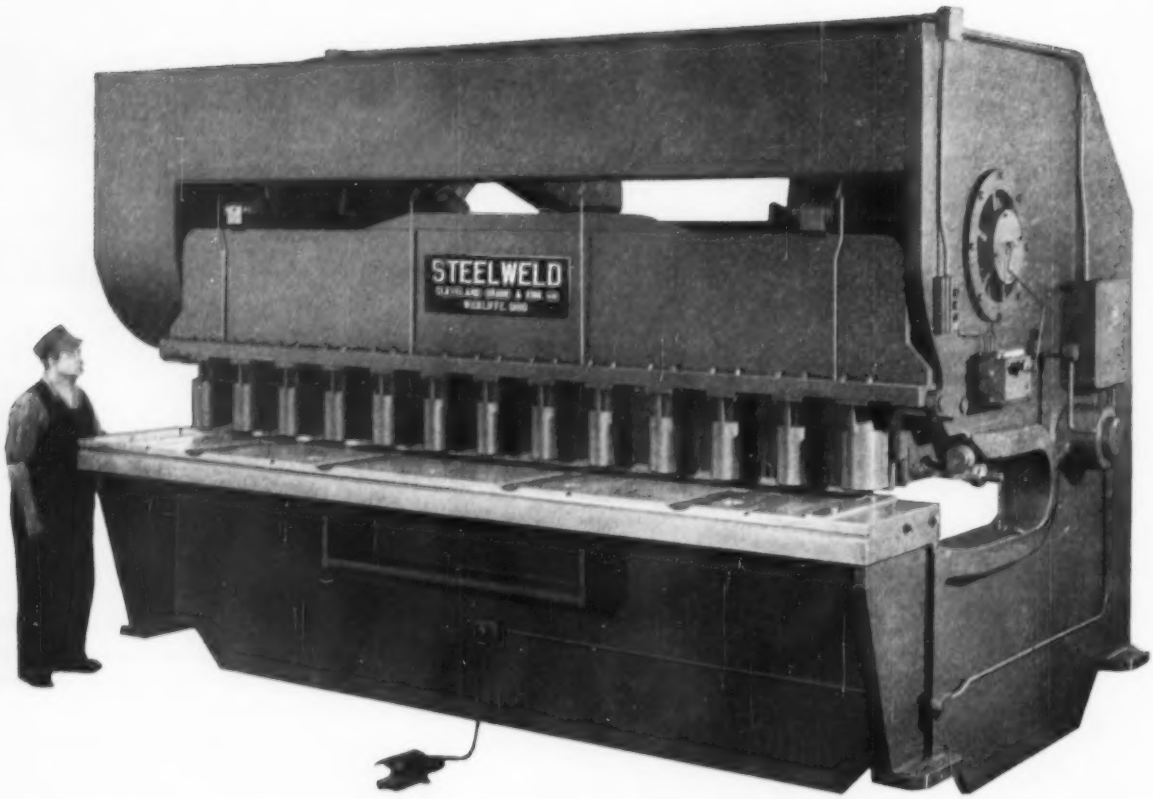
This part, shown in production plant photo, is die cast zinc 600 regulator body. Four tapping, one core drilling operations are performed in one setup, using indexing fixture. Production, 32 parts per hour. Rejections, less than ½ of 1%. No comparative data available as machine was purchased for this operation.

Vaporizer head (B1112 mild steel) work performed on the circumference and consists of center drill, 2-step drill, drill and chamfer, drill and tap. Work done in one setup on indexing fixture. Production, 17 per hour. Tolerances, .001" in size, .005" in depth. Production increased 200%. Rejections decrease from 4% to less than ½ of 1%. Six drill press, two turret lathe operations were eliminated.

For complete information, write Dept. ***AM-9***

BURG TOOL
Manufacturing Company, Inc.
15001 South Figueroa Street, Gardena, California

Sales Offices: **RIDGEWOOD, N. J.**—Burgmaster Eastern Sales Div., 86 N. Maple Ave., Phone: Gilbert 4-3002 | **CHICAGO**—Burgmaster Machinery Co., 5329 Lincoln Ave., Phone: UPtown 8-7161. | **SAN FRANCISCO**—Paul A. Kulju, 857 Estabrook St., San Leandro, Calif., Phone: LOckhaven 9-2244



CUTS 12 FEET 3/4 INCH STEEL PLATE

at 30 Strokes Per Minute

SOME FEATURES OF THIS SHEAR

1. Cuts by pivoted-blade principle.
2. Operated by electric foot switch.
3. Knife clearance adjusted by hand crank and dial indicator.
4. 36-inch throat permits slitting wide plate.
5. Lift-up type back gauge on ball bearings.
6. Heavy all-welded one-piece steel frame.

This is one of a complete line of Steelweld Pivoted-Blade Shears for cutting plate of all thicknesses from ¼-inch to 1½-inch and for lengths from 6 feet to 26 feet.

Steelweld Shears are radically different from all other shears now on the market. They have features never before possible. The revolutionary pivoted-blade travels in a circular path and overcomes handicaps of ordinary guillotine-type shears.

Not only are these machines easier to operate but their design assures smooth straight accurate cuts with minimum plate distortion. Their construction is extra heavy, and all modern features are incorporated to provide for ease of operation, minimum maintenance and long life.

Get the facts on these outstanding machines.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1410 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Start With the Schools

The critical shortage of engineers and scientists is causing much public wringing of hands. Less publicized is the serious shortage of skilled shop men.

The under-supply of good shop men is almost sure to get worse rather than better. As industry grows and mechanizes, many more mechanics and technicians will be needed.

How can more youngsters be recruited for these steady and essential jobs? What can and should metal working companies do to ease the shortage?

One thing that they obviously can do is to set up apprentice training courses if they do not already have them. That, however, is not the first step. The first is for management to give practical help to vocational schools.

Despite tremendous growth . . .

in college enrollments, the fact is that a very large proportion of teen-agers do not go beyond high school. More than that, a disconcertingly big percentage do not even finish high school.

What an opportunity for school authorities, with the aid and encouragement of industry, to take hold of tens of thousands of these youths and start them on profitable and prideful careers as skilled shop men and technicians.

That sounds like an easy assignment. But it is not. First of all, school officials must catch the interest of boys who are dropping out of school because of lack of interest. They also must hold the interest of those who don't drop out.

School people cannot hope for even a reasonable measure of success in this undertaking unless vocational training in general and shop courses in particular are accorded proper recognition. Shop courses should not be the last resort of boys who cannot get along in academic courses.

School administrators . . .

and shop teachers, in their effort to build vocational education into the powerful force that it should be, cannot be expected to do the job alone. They will need a powerful "assist" from industry; and that, in turn, means help from individual companies and from industry collectively in each community.

This "assist" could take many forms. Metalworking companies should work with local school people to see that vocational schools are adequately housed, equipped and staffed; that the curriculum is not only stimulating and rewarding but the best possible; that youngsters get a chance to see local shops and get the feel of what it is like to be in industry.

Schools should be visited . . .

by local manufacturers, who should show a personal interest in the students. Awards and scholarships, financed by individual companies or groups of companies, should be established to reward boys with outstanding records.

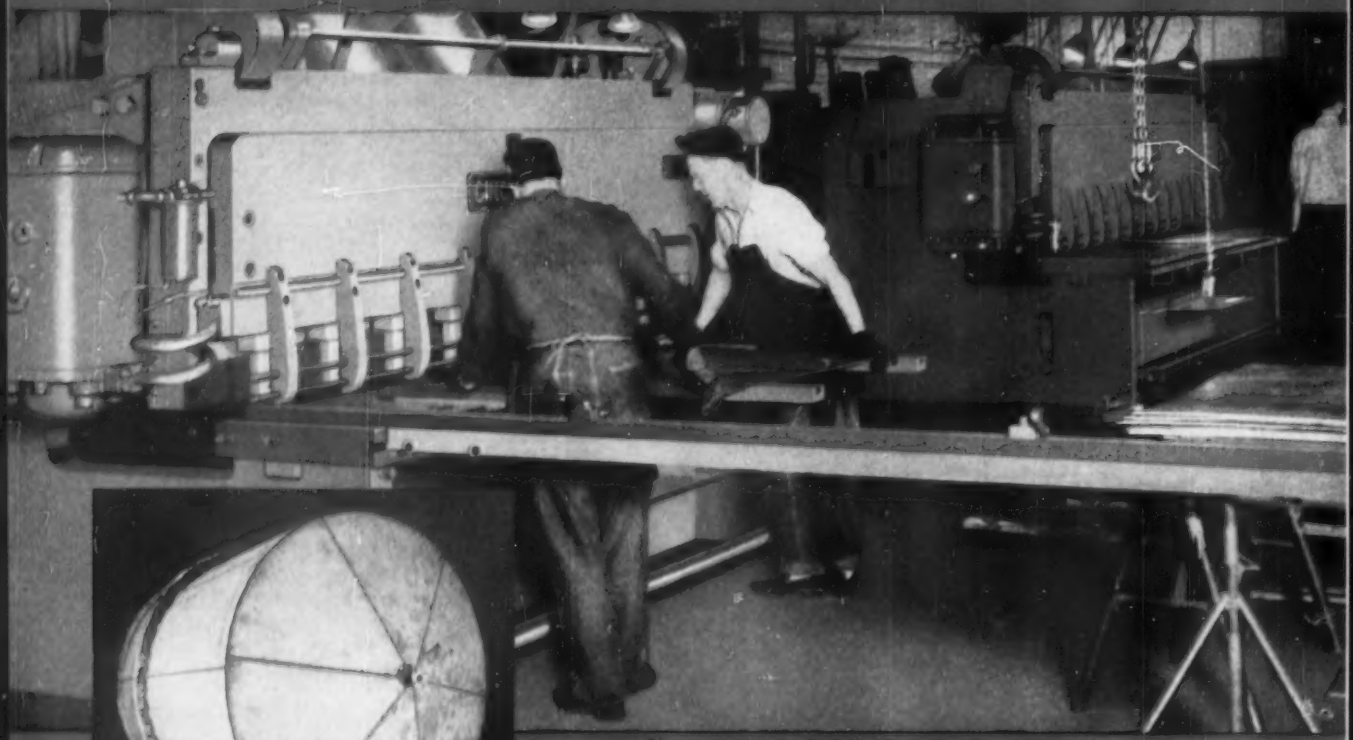
By this kind of cooperation with local schools, metalworking companies will perform a practical and much-needed public service. At the same time they will help provide a constant flow into their shops of intelligent youngsters with the basic skills so badly wanted.

Burnham Finney EDITOR

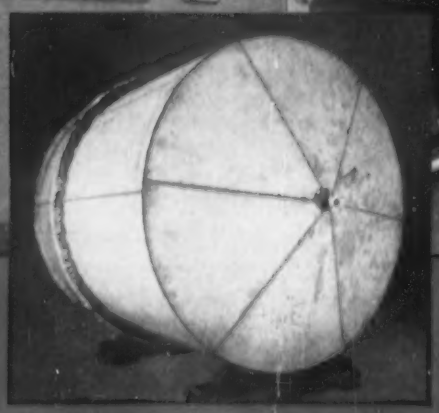
They handle the job faster with

CINCINNATI Shears

at LITTLEFORDS . . .



Photos courtesy the Littleford Bros., Inc., Cincinnati, Ohio.



Shearing stainless steel for tanks in the Littleford Shops.

"Faster handling—with a high degree of accuracy", say Littleford Bros.

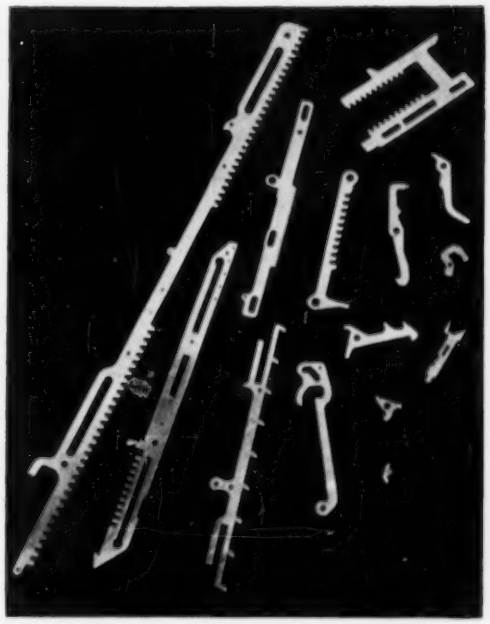
Simple, rapid and positive gauging, with the accurate shearing performance of these Cincinnati Shears—gives a clean cut, economical production, with long knife life and low maintenance.

Write for Shear Catalog S-7

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



PRE-TEMPERED STEEL SAVES HOURS of production time in the manufacture of precision parts. Well-designed carbide dies are required for stamping this material at pressures four to six times greater than is required for annealed stock. Here parts for Burroughs Corp "Sensimatic" accounting and other business machines are produced in a 90-ton Brandes press

Carbide dies

Stamp heat-treated strip... Cut production costs... Improve work quality

Stamping pre-tempered steel in thicknesses of 0.008 to 0.010 in. is common. Now stock as hard as Rc46, in thicknesses from 0.020 to 0.040 in., can be stamped into parts to close tolerances and high finishes. Heat treat, straightening, deburring, shaving, and other operations previously required are eliminated. Here's the story

GEORGE H DE GROAT associate editor

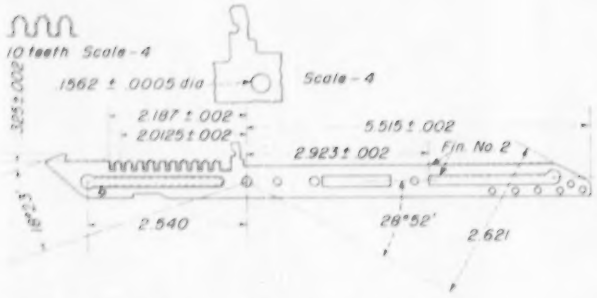
American Machinist

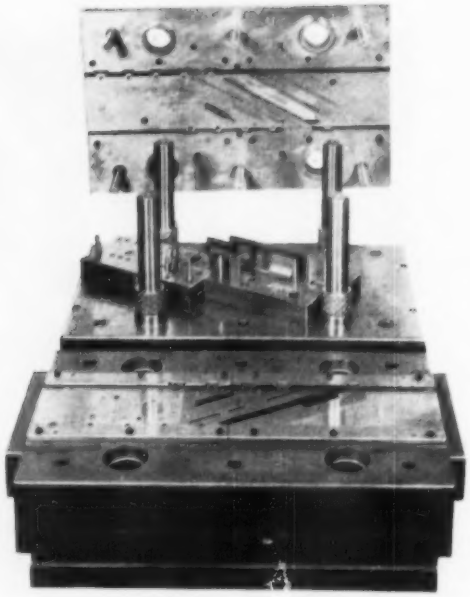
Material costs are higher and tools are more expensive, but the advantages gained by stamping precision parts from pre-tempered steel more than offset these limitations. The process is especially useful where distortion is ordinarily a problem—as in cases where parts made of annealed stock have to be heat treated after stamping.

With pre-tempered steel, work comes out of a die, finished—and made to the required hardness. Dimensional accuracies and formed sections are not lost through distortion by subsequent heat treating. Moreover, finishes are excellent, tool life is good, production rates are high— and usually a number of secondary operations are eliminated. Pre-tempered steels in various analyses are readily available from mills at costs ranging from 2½ to three times that of comparable annealed material.

Carbide dies built by Eglinton Carbide Products Inc. produce business machine, surgical, and camera parts from pre-tempered steel, (hardened to Rc46) to extremely close tolerances, good finishes, and, in

Carbide dies . . .





ABOUT 320,000 PER YEAR is the production volume on this business-machine rack. Carbide die is run at 80 strokes per min—saves Burroughs approximately $1.06 per part by eliminating heat treating, straightening, shaving and other operations formerly required. Die cost about $26,000—produces pieces with finishes equal to shaved surfaces—ready for deburring and plating

most cases, ready for assembly. Savings gained with these tools and pre-tempered steel are exceptional—in one case $1.06 per part—and quality is better than that obtained with steel dies and conventional materials. These observations hold true even though carbide dies cost as much as 2½ times more than good-quality steel dies for making similar parts from annealed stock. Die life, of course, is far greater than for conventional steel dies making similar parts.

GOOD DIE DESIGN IMPORTANT

Success depends primarily on good tool design and construction. In the first place, stamping pressures run from four to six times those required for working conventional material. To eliminate "Brinelling," hardened-steel backup plates are used behind punches and dies, in addition to hardened-steel retainers installed to maintain maximum alignment. For maximum compressive strength, punches and dies are Carboloy grade 55B carbide, and die shoes are cast Meehanite. Solid carbide punches have generous mounting flanges and are secured to punch plates by screws from the back. Tapped holes in sintered carbide, incidentally, are produced with electrical-discharge equipment. Because of the high pressures involved, solid "package" seating at the end of the stamping stroke is essential.

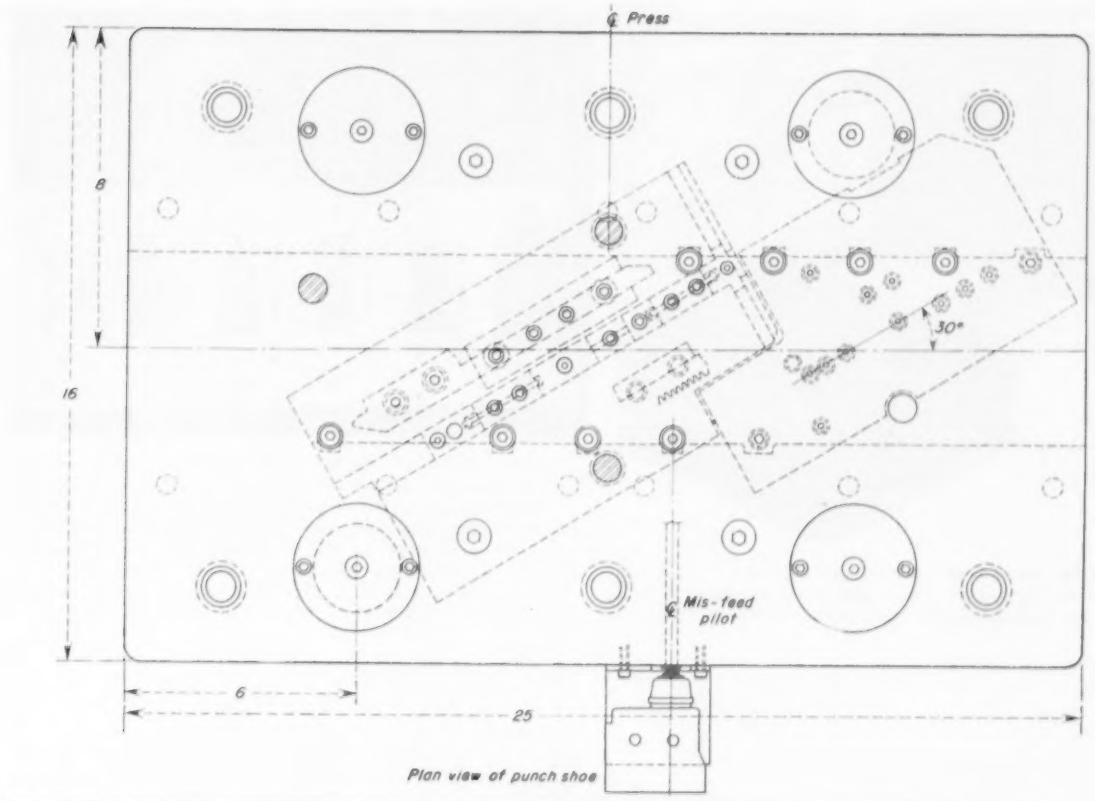
One of the newest developments in tool design for this work is a "solid" stripper, where a solid buildup of punch plate, stripper, and punch shoe is obtained at the end of the downstroke. This places the stamping load on the press crank instead of on the punches, to eliminate breakage and to increase tool life. To achieve this, the stripper-plate travel is limited to the bare minimum needed for pushing the stock away from the punches on the upstroke. But, at the end of the downstroke, the stripper plate is solidly in contact with the punch retainer plate. To eliminate deflection over long production runs, outboard rubber bumpers are employed in some setups to actuate stripper bolts through push rods, thereby eliminating pressure on the stripper plate.

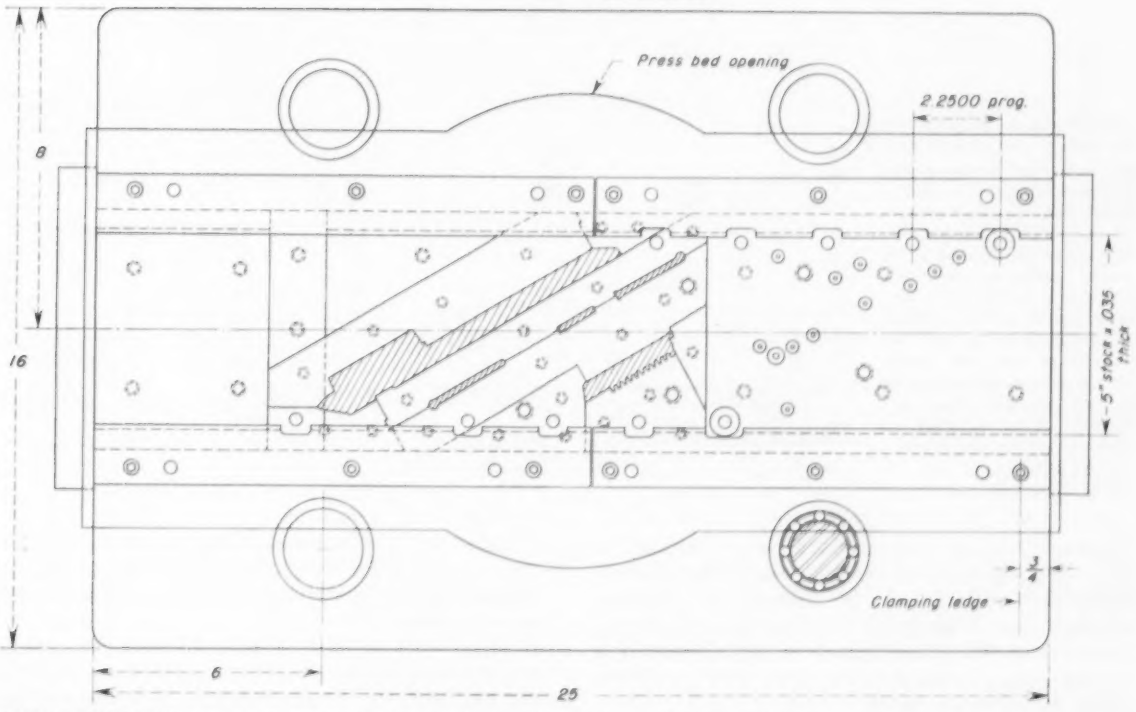
Maximum punch alignment is aided by keeping clearance between punches and stripper guides at about one-half that allowed between the punches and dies. This amounts to 2½% of the stock thickness, because punch and die clearances are held to 5%. Although fitting carbide inserts in place involves holding highly accurate dimensions, clearances between punches and dies are considered equally critical. A light is used for checking out these clearances first, in the assembly of the stripper and punch, then at the fitting of the punches and dies, and finally in assembly of all three components. Stripper guides are hardened-steel inserts that are fitted into the hardened stripper plate within extremely close tolerances.

PUNCHES DO NOT ENTER DIE

Other important design problems include shear in the punches. Hard material tends to spring away from the direction of the shear as the cutting action starts. Sectioned punches tend to spread apart unless shear is ground in a direction that forces them together. For precision alignment between punches and dies, 52100-steel guide pins are ground and lapped to run in Lempco ball-bearing cages in guide bushings with a 0.0015-in. preload. In some tools, auxiliary guide pins are employed—especially where progressive dies are relatively long. In such cases, four extra guide pins are installed near the center of the dieset in addition to four at the ends.

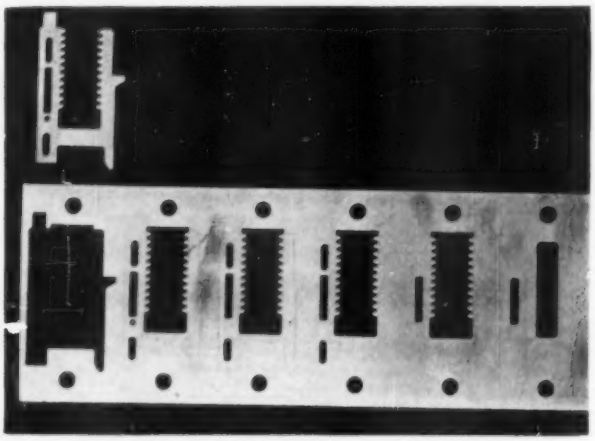
In operation, punches cut through approximately 10 or 20% of the stock thickness instead of shearing completely through. Pre-tempered stock breaks off cleanly at this point with only a little further advance of the punch. In this way, punches do not enter the dies and, of course, wear is considerably reduced. A slug problem is introduced by this action,



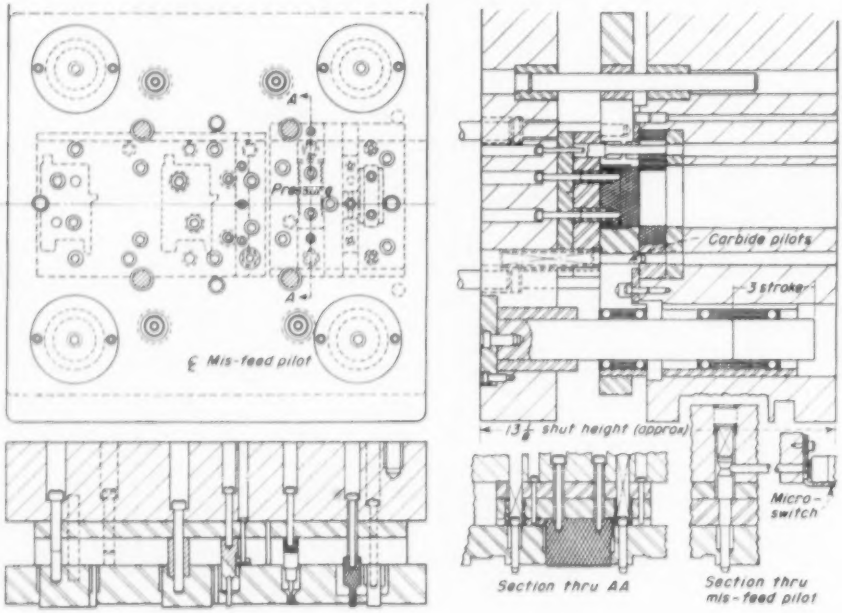


CARBIDE SECTIONS in 6-station progressive die for a business-machine rack are Carboloy grade 55B sealed on hardened steel backup plates. First station pierces two pilot holes in the strip and six holes in the part. Second station pierces two more holes and in the third, the rack teeth are cut and one more hole is pierced. Fourth station is idle, and three slots are blanked in the fifth. Sixth station blanks the finished part. Rack section is separate from blanking station to eliminate need for replacing entire section in the event of breakage

AUXILIARY GUIDE PINS insure accurate alignment in this 6-station progressive die for internal racks used in business machines. Eleven teeth are produced on each side of this internal rack—diametral pitch is 18, circular pitch 0.1745. Flatness of the finished part must be held within 0.005 in. and thickness is 0.035 in. ±0.001 in. Quantities required exceed 300,000 pc per year. Stock is 0.035-in. pre-tempered steel 5 in. wide—run at 80 strokes per min. As in similar work, finish on gear teeth, holes and slots is especially good—and eliminates subsequent reaming, shaving and other operations. Radii on such parts are limited to 0.010-in. minimum when material is 0.035 in. thick



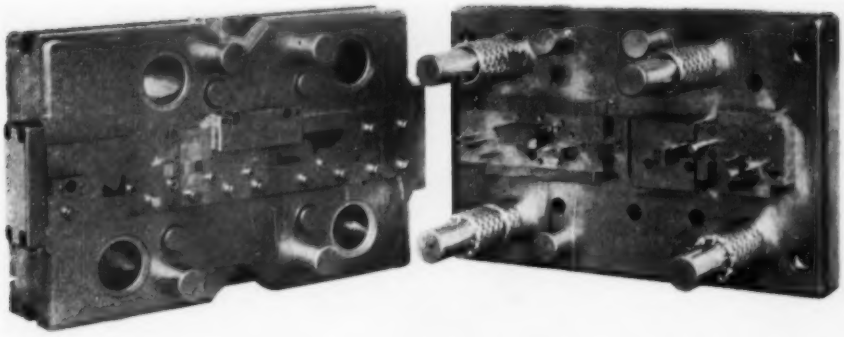
SIX STATION PROGRESSIVE DIE for internal racks produces 4800 pc per hr. First station pierces two pilot holes in strip, relieves center section to permit collapse of slug, and pierces one slot. Rack teeth are blanked in the second station and two slots are pierced in the third. Part is blanked in the fourth station and returned to the strip for transfer to the sixth station, (fifth is idle) where it is knocked through. Carbide pilots lead knockout punch by 0.015 in. and all punches miss entering dies by 0.005 in.



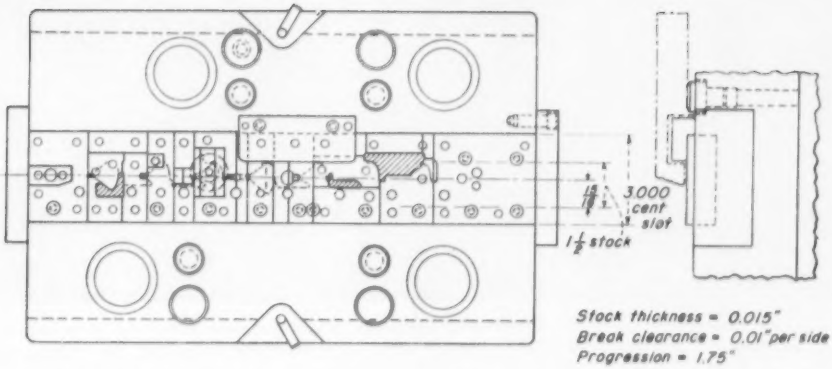
however, because they are not pushed through as they would be with conventional tools. This is overcome with such devices as applying air pressure through holes in the larger punches (working from a manifold in the punch shoe) or by employing a vacuum setup in the die shoe when punches are too small for air-blast holes.

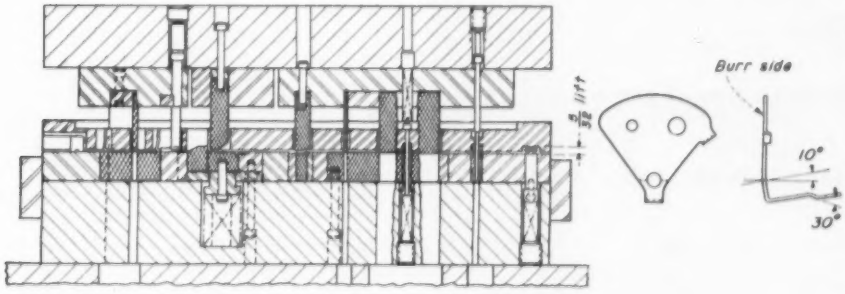
A standard feature on Eglinton dies is a mis-feed pilot that stops operation in the event of stock-feed trouble. This spring-loaded tool prevents continued pounding and resulting punch damage by collapsing when a mis-feed prevents it from entering a pilot hole produced for it in the stock. In collapsing, or backing up, it trips a limit switch connected to the press controls.

About 0.005 in. of stock is removed in sharpening these tools, and ½ in. of grinding stock is allowed for this purpose. At present little grinding of this kind has been done. One die, for example, made over 1,000,000 spring-tempered-steel camera parts from 0.015-in.-thick stock before grinding was necessary. With high-quality steel dies for the same part made



CAMERA DIAPHRAGMS are made of pre-tempered steel in this $10,000, 7-station, progressive die. Material is 0.020 in. thick, 1½ in. wide, with a hardness of R$_c$46. Stock is guided in grooves in spring lifter pins that bottom at the end of stamping stroke—raise up again on the up-stroke. Four bumpers control closed dimension for forming operations. Spring-mounted pilot lifters serve as additional lifters for the stock to facilitate forming. Production volume is 1,000,000 pc per year





FIRST STATION in this diaphragm die pierces three holes in the part and one pilot hole in the strip. Outside edge is trimmed next, and the tab separated in the third station. Fourth station forms a step on the tab, which is bent up in the fifth station. A small tab is formed next and in the last station, the finished part is cutoff. Die operates at 75 strokes per min.

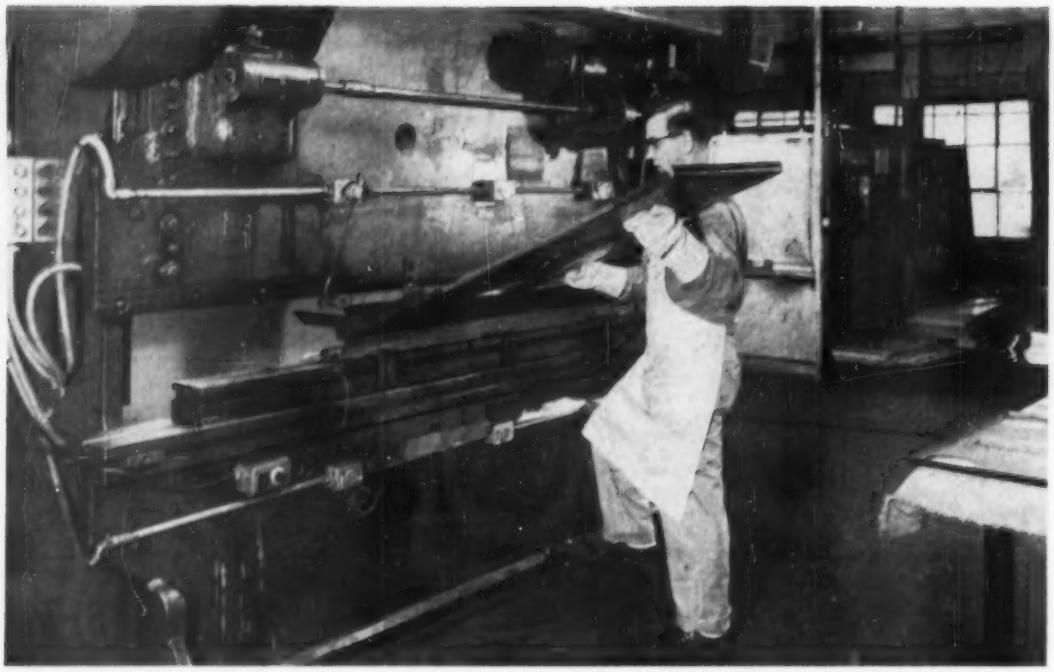
from annealed stock grinding was needed after every 10,000 parts, and after ten sharpenings the die was consumed.

ELIMINATE EIGHT OPERATIONS

In one application, carbide dies and pre-tempered steel eliminated tedious manual straightening and seven other operations on an internal rack used in Burroughs Corp business machines. Total time per 100 pc was cut from 3.5 hr to 0.33 hr— resulting in a savings of over 10,000 hr per year with a yearly production volume of approximately 316,250 pieces. Previously a blanking, perforating and trimming operation was performed on AISI 1070 annealed coil stock, followed by an additional perforate and trim. A third trim preceded cleaning, lapping to remove die burr, and cleaning again, after which the racks were tied in bundles, carbo-nitrided, then dismantled from the bundles. They were then placed in racks, cadmium plated and unloaded from the plating racks, after which they were stacked for broaching the rack teeth. Straightening and testing followed.

With a 6-station progressive carbide die and pre-tempered steel fed from a coil in a conventional roll feed, the parts are blanked, perforated, and trimmed in one setup. Die burr is then removed by tumbling —an operation previously impractical because of the distortion of ordinary materials by the tumbling action. After being plated they are ready for inspection. Finish on the rack teeth runs about 50 mu in. rms—comparable with that ordinarily obtained by shaving. Production rates run about 4800 pc per hr in a 90-ton Brandes press. Die cost was approximately $24,000.

Although current advantages with this process are outstanding, Eglinton believes die design and construction can still be improved. New developments and plans will undoubtedly lead to improvements in tooling, with resulting advantages in production.



HOT-FORMING OPERATIONS utilize preheated material and heated dies. 16-gage magnesium skins are stacked next to preheat oven (background)

To hot form magnesium . . .

. . . particularly in large sheets, some knotty problems were solved

Preheating, close temperature control, and careful handling were among the answers

S J BUSCH, plant superintendent
AMERICAN MACHINE & FOUNDRY CO, BUFFALO, N Y

The Buffalo plant of AMF's Defense Products Group has a reputation for solving knotty production planning problems in sheet-metal fabrication. However, when prints and specifications were received for an all-magnesium console, the size of an upright piano, all rules of the game had to be changed.

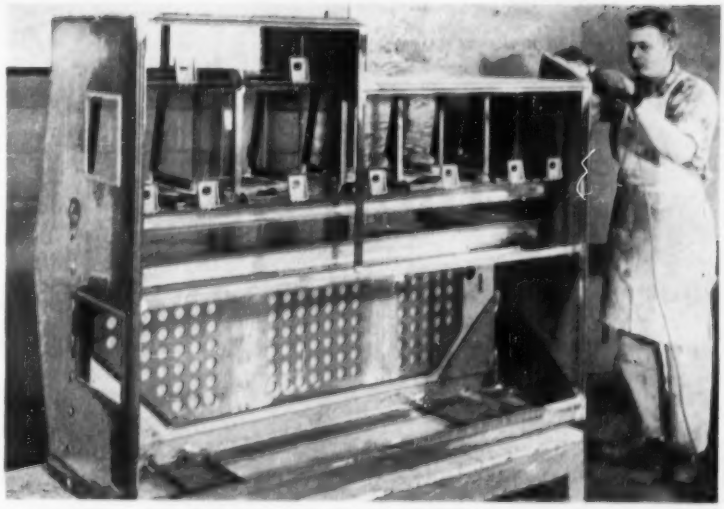
Previous experience with magnesium had been confined exclusively to small machining operations. Because production volume on this all-welded cabinet was fairly large, with delivery scheduled over a two-year period, a concerted effort was made to explore every aspect of handling magnesium sheet.

Normal procedures for handling a manufacturing contract were revised and, by closely integrating the contributions of the Project Engineering and the Production Engineering Departments during the production-engineering phase of the job, weeks of costly delay were eliminated.

Forming sheet magnesium was recognized as one major problem. While the group read whatever information was available and, in turn, briefed the shop to aid in making bends and radii, initial results were discouraging. Despite heated dies and preheating, the material either fissured or cracked outright and, in other cases, through overheating, buckled so badly it was impossible to use it. Forming temperatures were critical, ranging from 300 to 600 F, depending on the type and temper of the magnesium. Calculations and experience in the Manufacturing Research Department indicated that 350 F was the optimum temperature. Sample parts exhibited good material-flow characteristics in the bend area, without any significant changes in compression or yield strength.

Die steel was selected for the press-brake dies, which were designed to accept thermostatically controlled electric strip heaters. Both punch and die were designed to be approximately 3 in. higher than would normally be required for cold forming. This allowed room for strip heaters, which were bolted to front faces of the punch

HEATED MEEHANITE dies are used to form more intricate parts. Finished drawn part is left; preheating equipment at right



CABINET called for all-welded construction, honeycomb recesses, and rounded corners and edges. Finished product, built to machine-shop tolerances, will be used to house highly complex electronic equipment

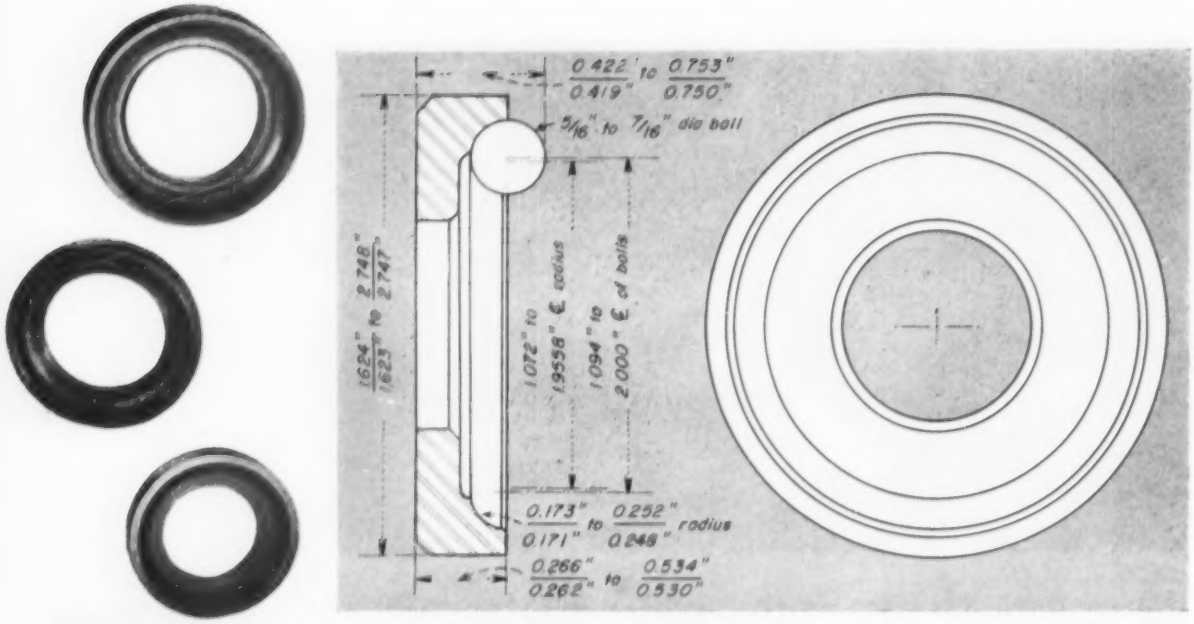
and die. For more intricate shapes, run in conventional form and draw dies, Meehanite was the die material. Wherever possible, heating was again done by ring or strip heaters, but some dies were heated with burners using a mixture of compressed air and city gas.

For preheating the sheets, a glass-fiber-insulated oven was used. It was heated by electric strip heaters, thermostatically controlled, and had a foot-switch-controlled electrically operated door. Shelves were of tubular steel, placed 6 in. apart, to permit free circulation of air. These ovens were placed adjacent to the press brakes.

Smaller magnesium parts gave no trouble, but bending of the larger sheets became a perplexing problem. In addition, strip heaters in the preheat oven were burning out frequently. Temperature in the oven, set for 350 F, was found to vary from 200 to 800 F. When the troubles, traced to restricted air circulation and mislocation of thermocouples, were corrected, heating-element failures dropped to zero and perfect sheets were produced.

While even heating and close temperature control solved major difficulties, other kinks developed, even a few with humorous angles. One operator, for example, periodically turned up with some oddly buckled sheets. It was found that he preferred cooling his comfortably broken-in asbestos gloves under a water faucet to changing to another pair that were cool. When reminded of the quenching effect on the work, he voluntarily declared the water basin "off limits."

Magnesium, unless protected, is subject to corrosion. This is particularly true during the humid summer months, when airborne chemicals react with atmospheric moisture to form corrosives that rapidly pock and pit the untreated sheets. A protective film of thinned 600W mineral oil or an ANC type I grease was applied to all sheet whether it was in storage or in process. Vapor degreasing before each hot-forming operation prevented dust and abrasive particles from clinging to oil-coated sheets and becoming imbedded in the bend area. Clean dies are equally important for preventing marring and damage to surface.



BEARING-RACE CUPS are ready for use (except for finish grinding of periphery and back faces) when they come from screw machine. Cups are made from SAE 1144 steel in range of sizes shown

Burnishing and hardening

Cycle time cut 96% for production lots of bearing-race cups when 8-spindle automatic is tooled to handle all operations except finish grinding

E E LEITNER, vice president and O C EMERSON, chief tool engineer, ROSS GEAR & TOOL CO, LAFAYETTE, IND

Today, finished ball-race cups can be made from bar stock and delivered to assembly in a half day at the Ross Gear & Tool Co plant. Previously, at least three weeks production time was required to schedule a lot of cups from bar stock to assembly—if there were no unusual delays. The cups are for thrust bearings that support the cams in steering-gear assemblies.

Steps previously required to produce the cups:

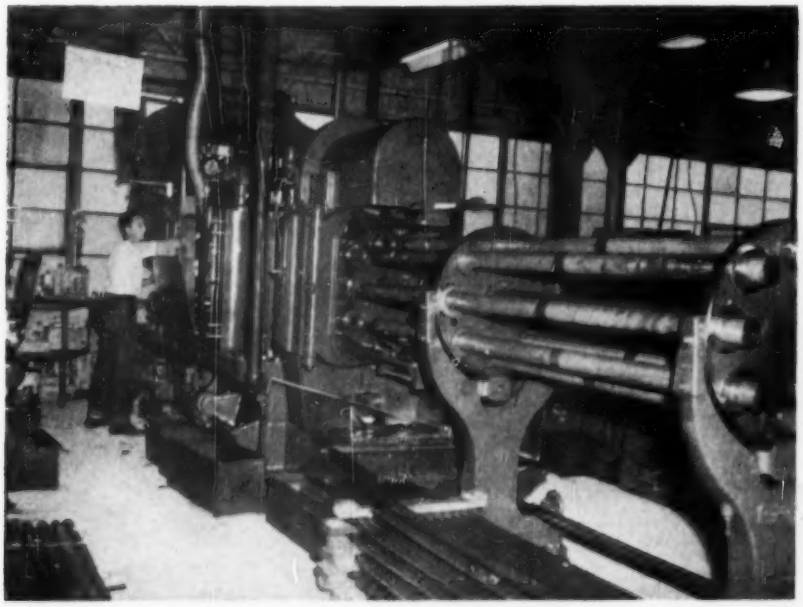
1. Rough machining from stock in multi-spindle automatics.
2. Trucking the cups to plating department.
3. Copper plating the OD and back-face surfaces to prevent carburization of these areas during heat treatment.
4. Trucking the cups to the heat-treating department.
5. Carburizing, hardening, and drawing the cup race surfaces.
6. Trucking the cups back to the machine shop.
7. Surface and centerless grinding the back face and OD.
8. Contour grinding the race surfaces.

After this the cups were ready for finished-part stores or for delivery direct to assembly stations. Now all of the necessary operations, except the surface and centerless grinding of back-face and OD surfaces, have been combined in new 8-spindle, 3-in. capacity Conomatic automatics.

Trucking to and from plating and heat-treating has been eliminated. In addition, roller burnishing of the race surfaces in the screw machine, prior to hardening, has replaced the time consuming contour grinding of the races.

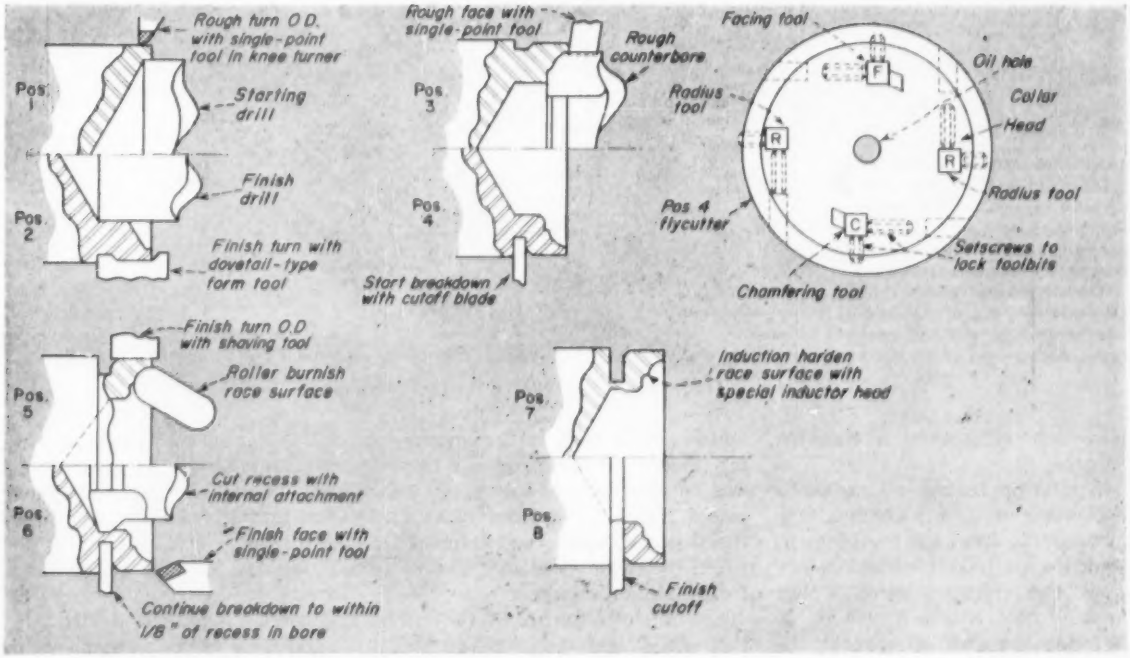
Key to this accomplishment is the use of induction-hardening and automatic spray-quench to heat-treat the race surfaces while the cups still are in the screw machine, before they are parted from the bars. Distortion of the cups from heat-treatment has been eliminated. In fact, scrap losses from all causes is less than 1% since installation of the new machines. And tests have shown that the roller-burnished and induction-hardened races last longer in service than do races finished in more conventional procedures.

However, a price must be paid for these accomplishments. Because the bearing race cups are ready to use when they leave the screw machines, except for grinding the OD and backface surfaces, the machines and cutting tools must be set up and maintained



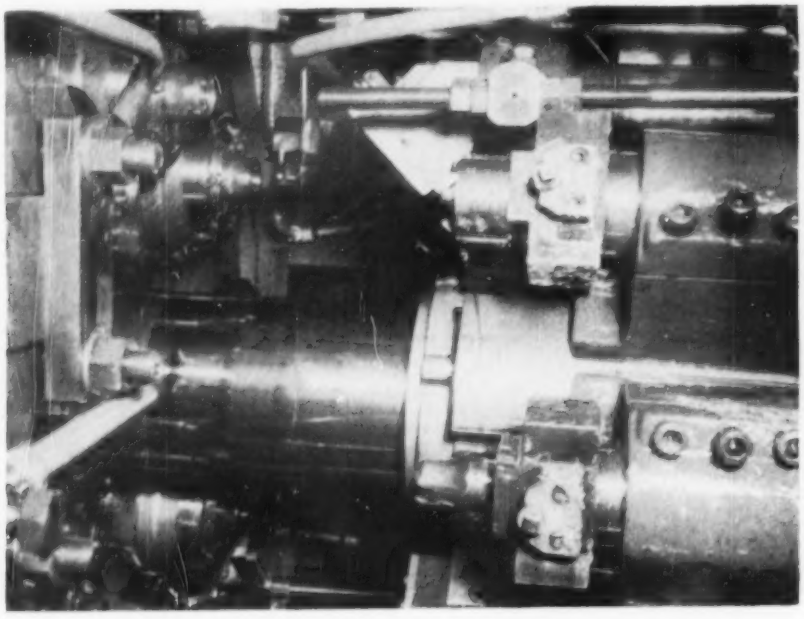
NINE SIZES OF CUPS are made in 3-in. capacity, Type GI, 8-spindle Conomatics by minor modifications in tooling and use of interchangeable inductor heads. Electronic generator and oil-handling equipment are on a platform above machine

built into automatic

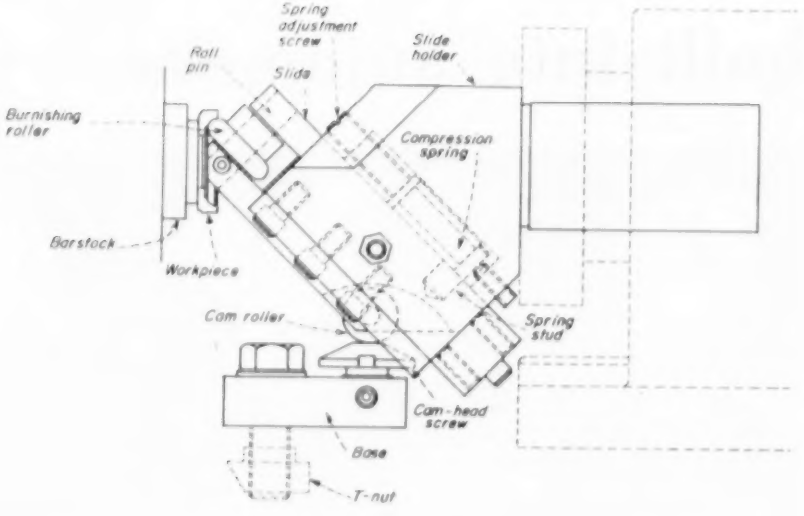


WORK LOAD IS DIVIDED as evenly as possible among the eight stations, as shown above. Originally form-relieved rough and finish counterbores (as shown at position 3) were used at positions 3 and 4. These are being changed to flycutter heads (as shown at position 4) each with four K6 carbide-tipped bits. Roller burnishing of race is at position 5, induction hardening at position 7. Feeds when machining largest bearing race up from 2⅞-in.-dia bars are 0.0022 ipr for all cross slides except position 5. Feed for shaving tool at position 5 is 0.0015 ipr. Feed for tool slide is 0.0045 ipr

Burnishing and hardening built into automatic . . .



ROUGH COUNTERBORE at position 3 is shown at bottom. Above this is the 4-bit flycutter at position 4. Above and behind this is burnishing tool at position 5. About 0.005 in. of stock is left for burnishing



BURNISHING ROLLER is mounted on upper end of 45° angular slide. HSS roller has radius slightly larger than ball to be used in race, is hardened to 64 to 66 Rc and polished to 4 microin. rms or better. Cam which causes roller to rise into cup is mounted on the cross slide for position 4 though burnishing tool operates at position 5

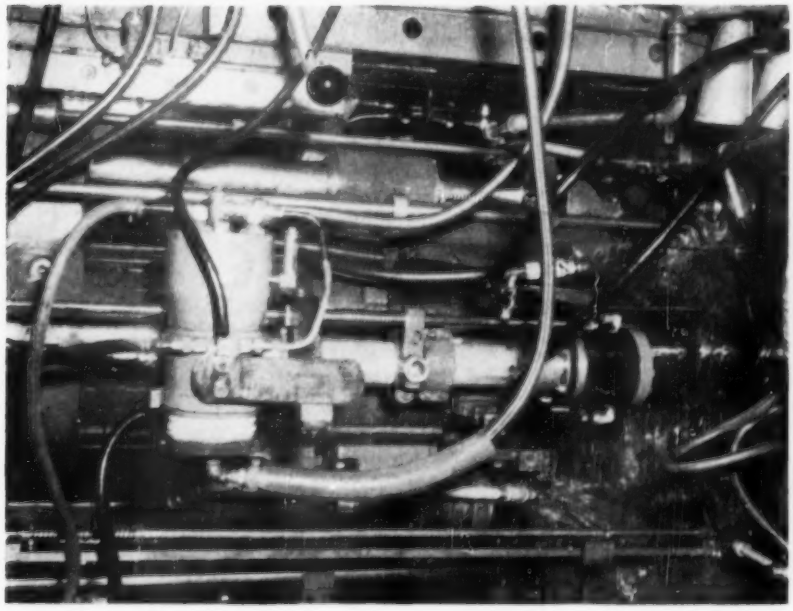
more accurately than is common practice.

Regular preventive-maintenance inspections and adjustments are necessary to keep the machines in condition to hold required tolerances. For example, spindle play must be held within 0.0006 in. at all times. In addition, except for two HSS drills, all cutting tools are carbide tipped.

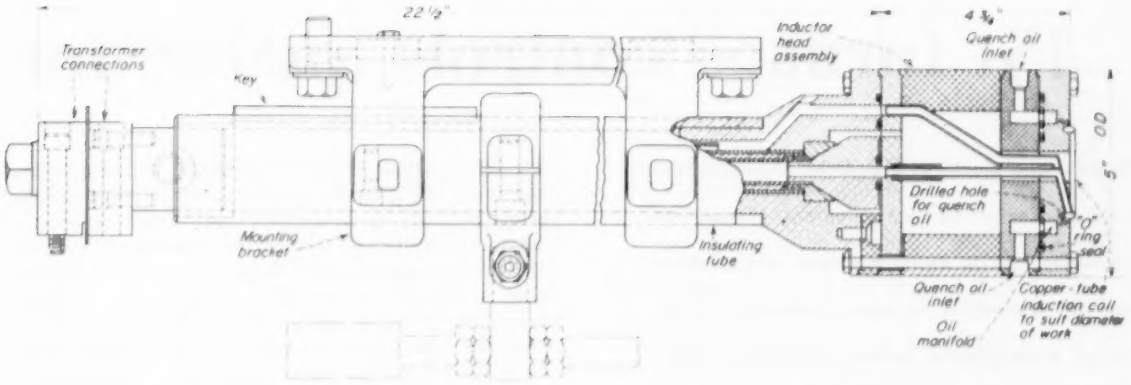
Another essential to success of this installation is careful selection and constant filtering of cutting oil, which also is used as the quenching media. The cutting oil must not contain active sulfur, which would attack the copper tubes in the inductor heads, and is chlorinated to insure long tool life between resharpenings.

Continuous filtering of the cutting oil is essential to clean, accurate roller burnishing of the race surfaces prior to hardening, and also aids in lengthening tool life. Any fine chips remaining in the oil when it is pumped into the burnishing station will cause scoring and pitting of the burnished surfaces, and will cause rapid wear of the periphery of the burnishing roll.

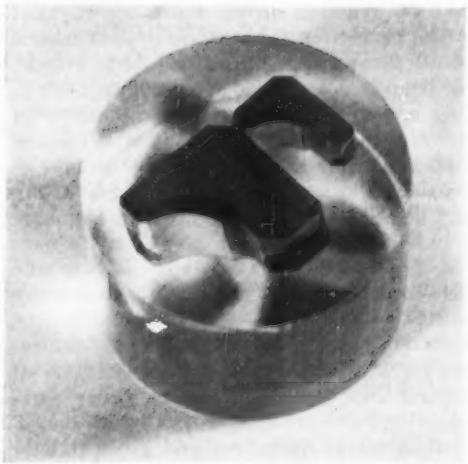
Early tests showed that without filtering, the oil could be used no longer than 2 to 3 hr before burnished race surfaces were too rough for use. Oil now in the machines has been in use for almost a year because continual filtering has kept it clean. Daily additions are made to replace oil lost on the chips.



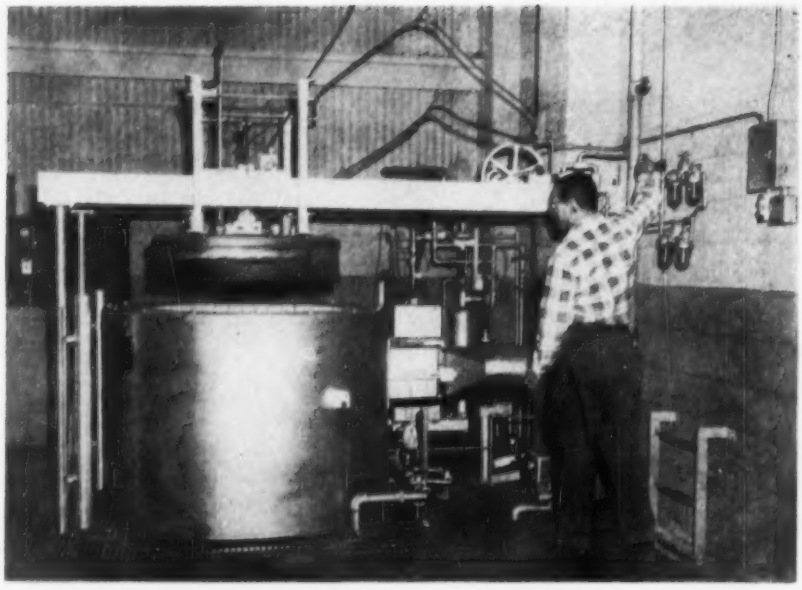
INDUCTOR ASSEMBLY is designed for easy removal so head can be changed when retooling for another size of ball-race cup. It is also removed when machine is used for other parts. Inductor and leads are carefully shielded.



INDUCTION COIL is single-turn, water-cooled copper tube surrounded by circle of small drilled holes through which quenching oil is sprayed. This oil is the same as cutting oil used at other positions. Heating and quenching cycle has automatic control



METALLURGICAL SECTIONS of hardened ball cups (largest and smallest of the nine sizes are shown). Black arcs are the hardened area. Cups are heated for 2 to 3½ sec, depending on size, then quenched. Hardness is 58 to 60 R_C



Air-operated lifter . . .
. . . removes door while operator is in safe position and moves it to one side so that he can drop hoist hook into the pit furnace to remove a heated load. Special lifter saves time, improves working conditions

Pit furnace controls quality for

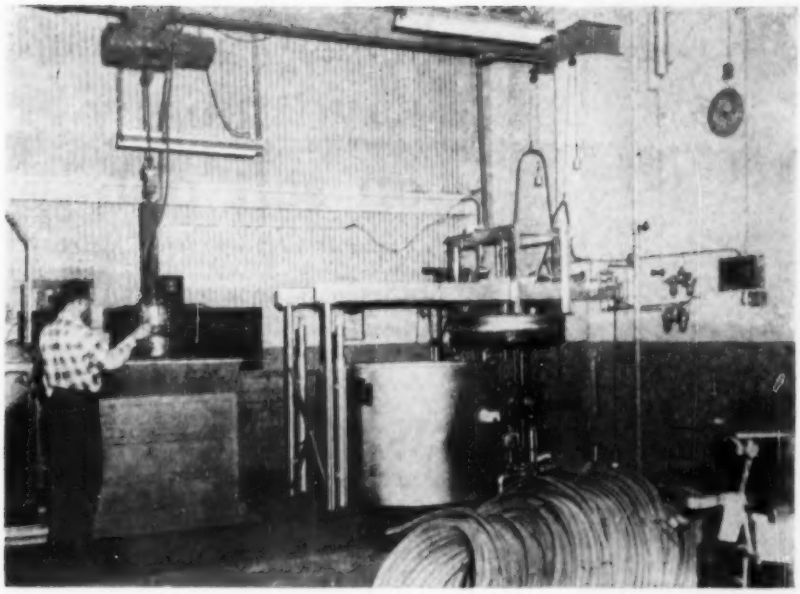
Physical and electrical properties of commutator stock are controlled by two means: (1) purchasing coiled rod to exact material specifications, and (2) annealing or age hardening in controlled atmospheres before redrawing. Here's a setup that saves labor, takes little space in the production line

ALBERT ROMEO, process engineer
NIPPERT ELECTRIC PRODUCTS CO, COLUMBUS, OHIO

Copper alloys with widely differing properties and heat-treating requirements are consumed in our electric-motor commutators and other products. These commutators are used in motors ranging in size from those found in electric shavers, to household appliances, to aircraft power systems. In order to control cost and quality of such diverse products, our management knows that all of our fabricating operations must be kept under strict surveillance. Exact material specifications plus precision heat treatment give us alloys that draw and machine at optimum speeds.

To obtain the required surface finish and physical and electrical properties, we use a pit-type Atmotrol furnace built by Surface Combustion Corp, Toledo. Operating temperatures range from 400 to 1800 F, because we anneal and solution treat a number of copper alloys in addition to commutator materials. Operational requirements range from 800 to 1750 F. Fan recirculation of the heated atmosphere within the furnace and through the work provides for quick heating, and it is useful in dropping the furnace temperature when required. Therefore, down-time is reduced when changing from a higher to a lower temperature.

The importance of fast heating and quick temperature changes is evident from looking at some of our alloys and their requirements. One silver-bearing copper alloy, for example, is heated at 1100 F for 1 hr, then water quenched, and given a light



Placed right in the production line . . .

. . . the pit furnace takes coiled rod from the stock handling area, heat treats it, and the monorail hoist serving the compact area takes the work to the water quench or pickle tank

redrawing copper alloys

pickle before drawing. A variant is to furnace cool. A zirconium-copper alloy is solution treated at 1300 F, water quenched, then aged at 800 F. A chrome-copper alloy is solution treated at 1750 F, water quenched and aged at 900 F, then furnace cooled.

Ease of handling is essential with so many materials to be heat treated. Two means of achieving labor savings are: (1) a special door-opening mechanism designed by Nippert engineers, and (2) the monorail hoist that transports coils to water quench or pickle tank.

The furnace is located in the stock area next to the drawing machines, and the furnace can handle coils of 26-in. OD. Three of these coils weighing 550 lb each can be treated in a charge. The whole installation, including generator, is in an area approximately 12 by 12 ft.

To save space and permit opening and closing of the door from a remote position for greater safety, Nippert installed a special safety door which lifts up, then rides away from the furnace opening. To accomplish this, two rails were placed over and straddling the furnace. A pneumatic lifting mechanism rides on the rails. The lifting mechanism is attached to the top of the door so that when it is activated, it lifts the door and, after proper clearance is made, moves just the proper distance from the furnace opening and holds at this position, until the operator wants to close the door again. All the operator has to do to open or close the door is to open or close a valve. Once the control valve is actuated, the door automatically completes the opening or closing cycle.

A Surface Combustion MDX-500 cfh generator produces an atmosphere of 10.2% CO_2, 0.0% O_2 and 2.2% CO, which is piped into the furnace. This atmosphere, in addition to permitting scale-free heat treating, also provides better volume for heat circulation to the furnace atmosphere. To further eliminate the explosion hazard, Nippert has installed a tank of nitrogen gas about 50 ft from the furnace and connected to it. Under normal operating temperatures there is no explosion hazard. However, before opening the door the furnace is purged when at temperature, to avoid explosion in case of safety equipment failure. Purging is accomplished by opening a valve at the remote nitrogen tank.

COMPACT INSTALLATION

As has been noted, many of the alloys are heated, then quenched. A monorail over the furnace also passes over the quench tank, pickle tank and the loading and unloading platform. This arrangement speeds handling of the coils. After air cooling or quenching, many of the coils must be given a light pickle. Since the monorail travels over the quench and pickle tank, the coils need to be handled in most cases only once, thus saving much time. After heat treating, the coils are either taken by lift truck to the drawing heads or are stored for later processing.

How to save money on salt pots

Pots fabricated from Inconel sheet have life increased to as much as 8000 hr. Here's how the job was done

GEORGE W WARDELL, chief engineer
ROLOCK INC, FAIRFIELD, CONN

1 . . Sheared Inconel . . .

is bevelled at proper angle to insure good penetration during welding. Grinding insures smooth edges

2 . . Welding is performed . . .

with inert-gas-shielded metal-arc process. Consumable electrode is Inconel wire

Even, uniform heating of parts at low cost has made the neutral-salts bath an economical, trouble-free process—with one exception. The salt-pot life is unpredictable and sometimes extremely short. Average life, which varies widely with service conditions, may run as much as 5000 hr, or as little as 200 hr or less. This, of course, results in tremendous uncertainty and relatively high cost per hour of operation. Recently, engineers at Rolock Inc, Fairfield, Conn, solved the problem with a newly designed pot fabricated from Inconel sheet.

These pots have turned in service records up to 8000 hr at temperatures of approximately 1550 F and have brought cost per hour down to a few cents.

The design of the pots is not radical. They consist of a dished, semi-elliptical head, a cylinder which forms the body, and a mild-steel flange at the top. As important as the design, is the carefully controlled method of fabrication—especially welding—which Rolock practices.

The fabricated pots have other advantages in that they lend themselves to repair after failure and give ample warning before they do fail. They do not suddenly drop their load into the furnace, ruining the refractory and the work, and spoiling the load of salt (at 20¢ a pound). Instead, the new pot will neck down at the top, near the flange, or develop pinhole seepage which is readily detected by smoking and sparking at the exhaust. This happens slowly and allows replacement and repair before it is too late.

The neutral-salt bath usually consists of a mixture of sodium chloride and potassium chloride which, when heated in oil, gas or electrically fired furnaces at elevated temperatures, become molten and act as a heating medium. Parts are submerged in the molten salt, which protects them from oxidation, and are brought up to hardening temperature. After a certain time at temperature, they are removed from the bath and quickly quenched.

The salts heat quickly and can be used over and

over again until they become too contaminated. They can then be reclaimed and used again.

The problems of fabricating a salt pot that increases life expectancy and reduces cost of the process even further are the same that exist in all heat-treating equipment. Service varies from shop to shop, as do conditions.

Yet, for the sake of production economy, one design had to be settled upon, one type of metal, and a systematized method of fabrication.

In selecting the metal, Inconel was a logical choice because, in this type of service, it has demonstrated superior characteristics of structural and mechanical stability at high temperatures, and resists corrosive attack and oxidation. It has proved capable of withstanding repeated heating and cooling over long periods of time without effect. It also is easily worked by common methods and, because careful fabrication is the key to long life, this is an important factor.

Fabrication begins with shearing the Inconel sheet for the pot body to proper width. Following this, the sheet is beveled on three sides, where the ends will later be joined in a vertical seam and where the body will join the dished head. The angle of this bevel is important to good weld penetration. Next, the sheet is run through rolls and formed into a cylinder. All parts for the pot then come together and are examined before welding. The cylinder, dished head and the mild-steel flange are checked for roundness and fit.

Great care is exercised in the actual welding, and Rolock credits this with the fact that it has never had a pot fail at a joint. Joints are cleaned carefully before, during, and after fabrication. The design avoids corner welds to eliminate stresses which tend to act eccentrically rather than axially, as in a butt joint.

WELDING TECHNIQUE

First step in welding is to tack the vertical seam along the side of the cylinder. This, and all subsequent welding, is done with an inert-gas-shielded-arc process which deposits a large amount of metal in a comparatively short time. Inconel wire is used as the consumable electrode, and all welding is done in the horizontal position for easier handling and faster welding.

Scarfing and wire brushing between each pass keep the joint clean as the weld metal is built up to complete the seam. Following this, the semi-elliptical head is welded in place.

The mild-steel, one-piece flange is fitted on and welded last. Later, this flange is drilled and tapped, and fitted with two steel eyebolts for lifting.

Final step in fabrication is to smooth off the weld seams and polish the pot lightly.

Each pot is then given a thorough radiographic study to detect any flaws that may have developed in welding. Even with extreme care, defects occasionally appear. These are corrected and the pot re-X-rayed.

After inspection each pot is given a full, even

3 . . Wire brushing . . .

insures clean weld surface and eliminates feather edges that might affect X-ray inspection

4 . . Mild-steel flange . . .

is joined to pot body from the inside and outside, using power-operated rolls to permit downhand welding

How to save money on salt pots . . .

anneal. Practice in the industry has been to supply pots without annealing and then run through several "dry runs" in the furnace. This is not too satisfactory because pots annealed in this way do not get the thorough annealing necessary for best life. Moreover, the annealed pot is ready to use as soon as it is installed.

Close to 100 of these neutral salt pots have been put into service under the trade name of "Neu-Pot." One of the older installations at Eastern Heat Treating & Brazing Corp has been in service 3300 hr and the pot is still in excellent condition. The relatively thin section of the pot has reduced recovery time, with a resultant speed up in cycling.

Actual life expectancy has not been determined, although field tests indicate a minimum of 3000 hr can normally be expected with recommended practice. It will, of course, vary with conditions and treatment. Pots now in service are being subjected to a wide variety of conditions. All are performing well and some have given over 8000 hr, reducing cost of operation per hr in some cases to as low as 5¢. This compares very favorably with cast, steel, or coated pots, which may average between 45 and 75¢ per hr.

5 . . Eyebolts . . .
threaded into flange make installation simple at Eastern Heat Treating & Brazing Corp. Factory anneal does away with customary "dry run"

Russian and German carbide standards

In both Germany and Russia a standard system of carbide designation has been adopted and is used in all technical literature. Translations from the German and Russian often use these designations, since no similar standard is in use in this country and it is therefore not possible to make a conversion.

The table given here will be helpful in identifying some of the generally used types of carbide referred to in translation, or in literature in the original language.

Soviet carbide designation is based on chemical composition. Letter symbols have the following meanings:

W — Tungsten-carbide

T — Titanium-carbide

K — Cobalt

N — Nickel

After the letters the content in % is given. Types with the same chemical content but with differing characteristics have at the end of the designation a further letter symbol *e.g.*, U or S.

A carbide similar to the German H1 carbide, with a content of 94% tungsten-carbide and 6% cobalt would be known in the Soviet as WK6. A carbide similar to the German L2 carbide (15% titanium carbide, 8% cobalt, remainder tungsten-carbide) but with 6% cobalt, is known as T15K6. Two improved types of the same composition are T15K6U and T15K6S.

Compared with German standard carbides, the Soviet carbides of the same hardness have a lower bending strength. Their usefulness may be less than comparable German types.

GERMAN AND SOVIET TYPES OF CARBIDE

Symbol	Content (%) WC	TiC	Co	Hardness Rockwell C	Bending strength (kg/mm²)
T5K10 (Russian)	85	6	9	90.5	135-140
L3 (German)				88.5	115
(old symbol S3)	88	5	7		
T15K6	79	15	6	90	150
L2 (German)				88-90	110-125
(old symbol S2)	77-78	14-15	8	91.5	115-135
WK8 (Russian)	92	—	8	87-88	130-150
WK6 (Russian)	94	—	6	87.6-88	120-140
WK3 (Russian)	97	—	3	89-90	100-105
G1 (German)	94	—	6	90	160-165
H1 (German)	94	—	6	91	150-160
H2 (German)	91.5	—	7		

Round Table

Vibrating Nerves

"I got a funny complaint from Ritter yesterday, Al. He's all worked up about that high-speed punch press we moved in next to him. Claims it makes him nervous."

"That's a laugh, Ed. His own machine is easy the loudest in the whole shop."

"That's what I told him, Al; but he's still squawking about it. I've got half a mind to can him. It's obvious he's just trying to make trouble."

"Maybe not, Ed. It might be he's really being honest about that other press. It's possible he's gotten so used to his own machine he doesn't notice it any more. It's a sure thing that other press is a noise maker."

"That means I have to put each press man into his own little plant, separated from all the other presses by at least 500 yards. Nuts to that, Al."

"Not at all, Ed. I think you should get Harrison to bring in a noise expert. I've read that some noises bother you, while others that are just as loud don't. Besides, there may be a psychological basis to it."

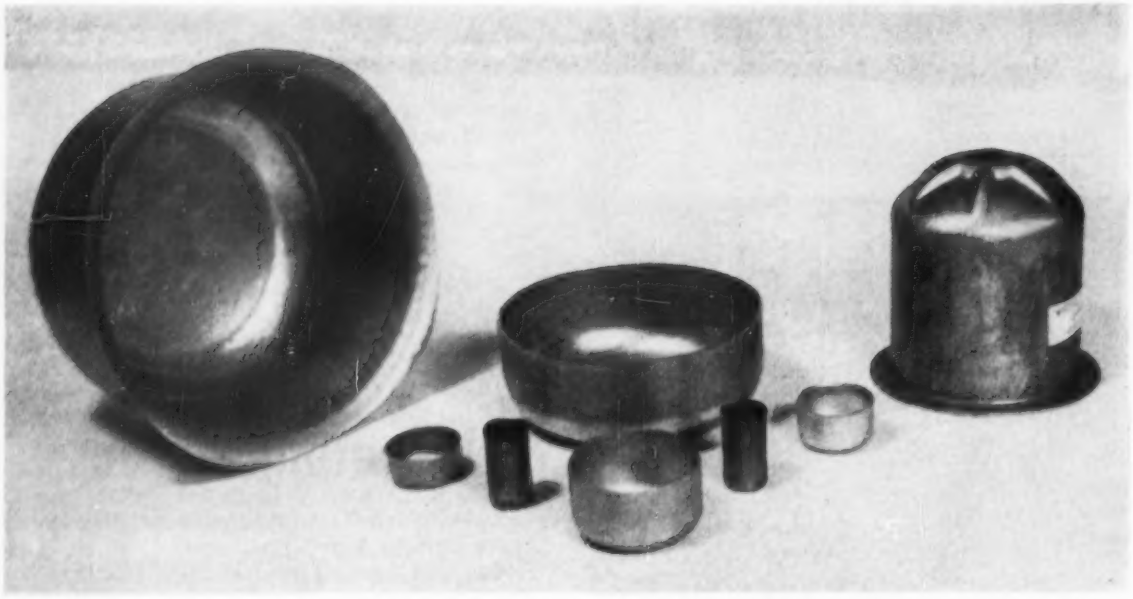
"Yeah; Ritter's jealous that there's another machine in the place that makes more noise than his own."

"Very funny, Ed. But seriously; maybe that high-speed press makes a more annoying racket than Ritter's press. You might check around and see what other operators think."

"They probably haven't even noticed it, compared to Ritter's machine. I'll see if I can find a pair of ear plugs for Ritter, and I'll tell him to knock it off. If I get any complaints from other workers, then I may have to do something more drastic."

"Maybe you'd better do something now, before somebody decides he's got cause for a workman's compensation claim, Ed. Ear damage is something the courts are getting real touchy about, these days."

***SHOULD ED** take Ritter's gripe seriously, considering the fact that his own machine is noisier and doesn't seem to bother him? Or is there something to Al's suggestion that noises aren't all the same? Your ideas may help others. Discussions of earlier topics start on page 230.*



Typical titanium drawings, ranging in stock gage from 0.016 to 0.078 in., were formed cold

What happens to titanium alloys when you draw cups?

It's an ornery material in any operation, and drawing is no exception. But several titanium alloys come up with the highest strength/specific weight ratio of any material that can be drawn. Add its heat and corrosion resistance, and you have an outstanding possibility for future applications. Here are some results and conclusions of research done by Worcester Pressed Steel, which explored the fundamentals of titanium deep drawing under the sponsorship of Watertown Arsenal

CARTER C HIGGINS, president;
WORCESTER PRESSED STEEL CO, WORCESTER, MASS

Titanium alloys are only slightly more expensive than commercially pure titanium, but their properties are much more attractive for drawing. Pure Ti has a yield strength of 70,000 psi and a weight of 0.163 lb/cu in., so strength/specific weight ratio is 429,000. This drops a bit when the operating temperature range is around 500-600 F, but the material has remarkable resistance to creep at intermediate temperatures.

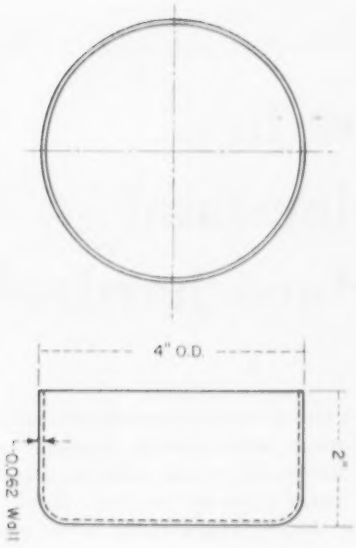
Four of the available titanium alloys have yield strengths of around 110,000 psi; and with the same specific weight, their strength/specific weight ratio is 675,000—better than aluminum (416,000) or SAE 4130 chrome-molybdenum steel (530,000). These four alloys are:

C 110 M (8% manganese)
A 110 AT (5% aluminum, 2½% tin)
Ti 6A 4V (6% aluminum, 4% vanadium)
RS 110 BX (manganese aluminum)

METALLURGY

Titanium has three crystal forms. Commercally pure metal and alloy A 110 AT are made up of alpha crystals—hexagonal and close-packed. Another form

Titanium-drawing research produced stacks of cups, proving the material can be drawn; but cost of material is still high



Cup should be drawn at slow speed. Alloy A 110 AT requires heated dies, but same shape can be drawn in pure Ti or other alloys with little or no heat, if stock is thin

of titanium is beta crystals—body-centered cubic. This form is too stiff for sheet use at present. The third form is a combination of alpha and beta; the other three alloys are of this structure. The combination can be heat-treated, which raises hardness and yield strength. If the alloys are heat-treated and slow-aged for 24 hr at 900 F, the yield strength jumps to 161,000 psi, which means strength/weight ratio is 950,000.

Alloy C 110 M resists contamination well and is a good forging alloy. When drawn into cups, it is likely to "season" crack the next day unless it is stress-relieved. This does not lower hardness much, but a full anneal will probably allow this alloy to be redrawn as economically as pure titanium.

A 110 AT is stiffer, with good hot and cold resistance to oxidation, and good weldability. It requires slow drawing speeds, and draws best at 1200 F or higher. Cups with a 3-in. dia and 2.3-in. depth were drawn from 6-in. disks (50% reduction) of this alloy. It is difficult to get more than 50% reduction with the alloys, although about 55% is possible with plain titanium. Heating it helps on ¼-in. stock, and may be needed for 0.150-in. and up.

Heated dies are necessary for A 110 AT to increase the spread between yield and tensile strengths. To get the temperature to 1200 F, a new technique was used in drawing, with electrical heating elements cast into ductile-cast-iron dies. The other three alloys do not require as high a temperature as A 110 AT, but some heat is desirable.

Ti 6 Al 4 V is heat-treatable and is metallurgically stable under stress up to a temperature of 1000 F; it is also weldable, and is being widely used in forging. RS 110 BX has slightly higher yield strength, and it air-cools after annealing.

CURRENT PROBLEMS

Titanium poses some problems because of off-gage stock, which isn't surprising in view of the newness of the alloys. Surface conditions and inclusions are no longer a general problem, however. Most of the metal has shown marked directional properties; ears developed on cups. If the directional properties were uniform from lot to lot, odd-shaped blanks might be used; otherwise the blanks should be oversize, allowing for considerable trim.

Tests in cup drawing from larger and larger blanks, with a set cup diameter, showed some troubles that could be readily identified and corrected by capable tool design. Full effects of heat and wear on ductile-iron and carbon-steel die rings have not yet been determined. There is some tendency to gall, because the metal thickens around the cup rims, and the best lubricant has not been determined. Testing was done in a special subpress with measuring instruments, installed in a 300-ton hydraulic press.

One particular problem for titanium stampers appears to be costs. Titanium has low scrap value, but costs $16/lb; or about $6/lb more than forging stock. Many parts normally stamped in the past can now be forged, because forgers can work to closer tolerances. In these cases a 30% loss in skeleton scrap may make stamping impractical. On the other hand, we've found that a good set of press tools that will save scrap stock can quickly be amortized.

How to understand surface hardening

It's a good idea to review processes like carburizing, nitriding, carbonitriding, cyaniding and induction hardening, because more heat-treated parts are being made all the time. Details of practice or the advantages of the newer mechanized furnaces may have escaped your notice. But whether rediscovered, or learned for the first time, these details may well be useful in solving some of your problems

WAYNE L. BESSELMAN, head, Furnace Section
LEEDS & NORTHRUP CO., PHILADELPHIA

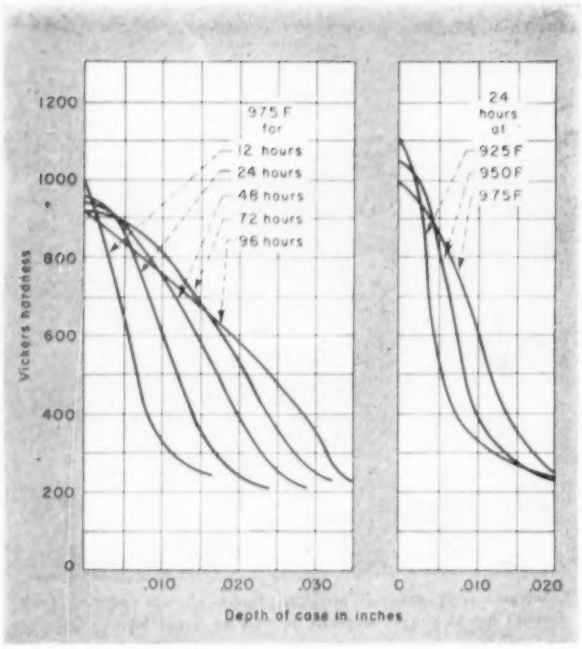


FIG. 1 . . Nitriding cycles range from 12 to 96 hr. *Left*—Buildup of Vickers hardness and case depth with time at a constant temperature of 975 F. *Right*—Temperature affects case hardness; hence, a uniform furnace temperature is essential

Steel alloys are surface hardened to provide a hard, wear-resistant surface backed up by tough resilient sub-surface metal. Hardened parts so prepared will withstand severe impact. There are literally thousands of different items that are surface hardened by the metalworking industry — gears, cams, levers, shafts, rocker arms, pins, bearings, bolts, crankshafts, axles, sockets — even snap fasteners for clothing.

Three generic methods are available to treat or prepare a part for surface hardening:

Nitriding—the part is heated to an elevated temperature and exposed to active nitrogen which diffuses into the steel alloy and reacts to form hard nitrides.

Carburizing depends upon the presence of carbon to form hard structures when the part is quenched. The carbon is placed in the steel alloy by a diffusion process, in which the part is heated to an elevated temperature in the presence of active carbon.

Carbonitriding or **Cyaniding** is a combination method. Here, the parts are heated to an elevated temperature and exposed to both active carbon and active nitrogen, which diffuse into the steel surface. The parts are later quenched to develop the hard case.

Equipment used for heating the alloy parts falls into three categories: furnaces, salt baths and induction machines. Furnaces may be of the batch or continuous type. Salt baths for surface-hardening applications are generally of the pot type heated by electrodes immersed in the salt.

Induction machines may be of the motor-generator type or of the vacuum-tube oscillator type.

Each method of surface hardening as well as each type of equipment has its advantages. Choice of method or equipment depends upon many factors, including cost of equipment, production quantity, size and shape of part, application, fuel supply, available space and personnel.

NITRIDING REQUIRES MANY HOURS

In this process parts of special-composition alloys are surface hardened by heating them to 925 to 1100 F in an atmosphere of ammonia and dissociated ammonia. The steel must contain elements that form stable nitrides, such as aluminum, chromium, vanadium, molydenum and tungsten.

At the temperatures used, ammonia decomposes into nascent nitrogen and hydrogen at the steel surface. In this form, the gases are unstable and rapidly go to molecular nitrogen and hydrogen. Nitrogen is absorbed by steel in only the nascent state. Therefore, it is necessary to provide an adequate flow of ammonia to assure a sufficient supply of nascent nitrogen. Fig. 1 shows the case depth and hardness obtained at 975 F when the heat-treating cycle is varied from 12 to 96 hr. Also shown are the case depth and hardness obtained in 24 hr when the temperature is varied from 925 to 975 F.

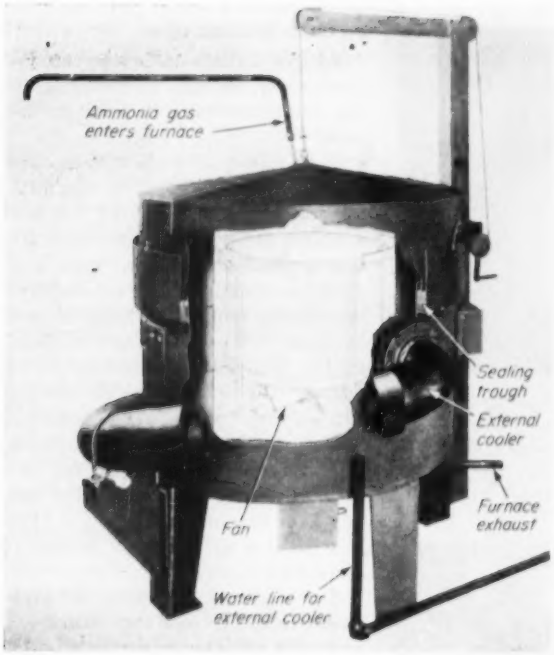


FIG. 2 . . Fan circulation properly distributes the ammonia atmosphere in this pit-type nitriding furnace. Electric heating elements surround the work container

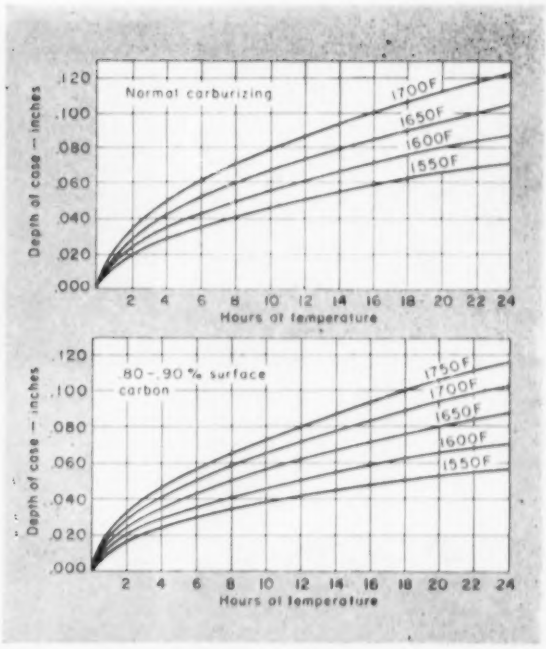


Fig. 3 . . Control of carbon potential in the carburizing atmosphere is essential when heat treating alloy steels to 0.80 to 0.90% surface carbon. With normal carburizing (above) the time to achieve a case depth of 0.060 in. at 1700 F is only 6 hr. The surface carbon will be nearly 1.30%, which is too high for highly stressed parts. With carbon-potential control (below) the cycle will require 8 hr, but surface carbon will be held within the desired range of 0.80 to 0.90%

The latter graph indicates the need for good temperature uniformity in a furnace, if all parts are to be uniformly nitrided.

Furnaces used for nitriding are frequently of the batch type with a fan for forced circulation, to circulate the atmosphere to all work surfaces and to obtain good temperature uniformity. Fig. 2 shows the cross-section of a typical furnace. Parts are placed in a container and lowered into the furnace. When the lid is replaced, a skirt dips into a sealing trough that contains oil to prevent escape of ammonia gas. Electric heating elements surround the container, and a high-speed fan at the bottom circulates the atmosphere. The ammonia supply enters through the lid. Exhaust gases pass out at the bottom through a pipe line, which is vented outside the building.

At the end of the heat-treating cycle, the furnace must be cooled to about 300 F to protect the parts from air and to avoid an explosion hazard. Cooling down is accomplished by circulating the furnace atmosphere through a water-cooled heat exchanger.

Control of the process is simple because it is only necessary to control the flow of ammonia to produce about 30% dissociation in the exhaust gas.

In nitriding it is not necessary to quench the parts to obtain surface hardness. The nitrides are hard when formed. This is advantageous because the parts can be treated in their finished condition and distortion is held to a minimum. The hard nitrided surface will remain hard at temperatures to 1100 F in service.

The nitriding process is expensive because of the cost of the special alloys and the length of cycle. Obviously, where the properties produced are required by service conditions, the expense is more than justified.

GAS CARBURIZING

This process of surface hardening involves two steps. The parts are first heated to temperatures of 1550 to 1750 F in the presence of active carbon, then quenched in oil or brine to produce the desired surface hardness.

The process may be utilized to place a high carbon case on the work surface, or to restore carbon lost from the surface by prior treatment.

Present practice in most plants is to gas carburize. An adequate source of active carbon may be natural gas, propane, or liquids that are usually blends of hydrocarbons and oxygenated hydrocarbons.

When propane or natural gas is used, it is common practice to use a carrier gas in order to reduce soot formation and to obtain lower surface carbons. The carrier gas is generated in an endothermic-type generator to a nominal composition of 40% H_2, 40% N_2 and 20% CO. Proportions of enriching gas and carrier gas depend upon the size of the furnace, load size, temperature and surface carbon required.

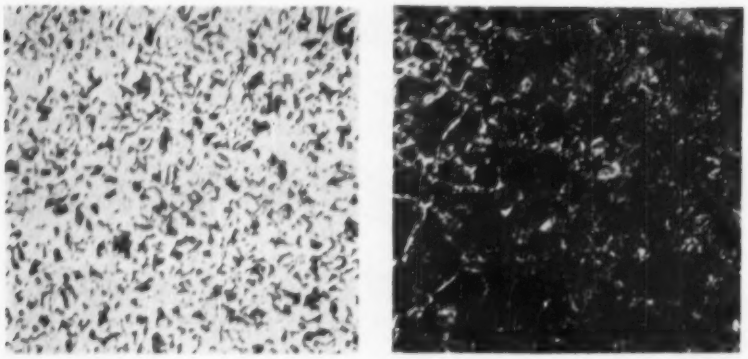


Fig. 4 . . Carbon enrichment of SAE 1315 steel is demonstrated for the leading edge of a cam. *Left*—as machined conditioned. *Right*—after gas carburizing at 1700 F for 2 hr, using an atmosphere with a 0.90% carbon potential to avoid carbide networks and massive carbides

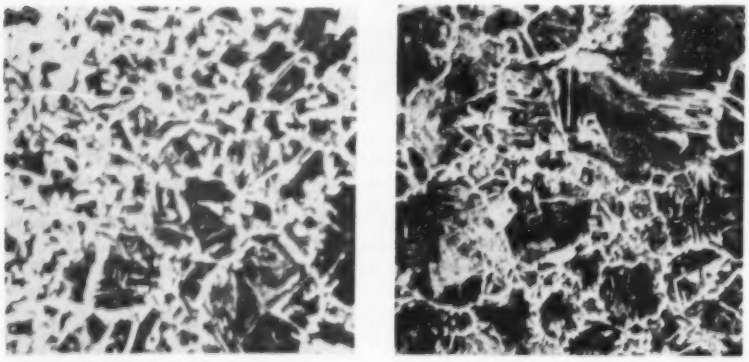


Fig. 5 . . Decarburization can arise during fabrication, as for example, copper brazing a rifle bolt, which had a head made of SAE 4640 and a body of C1137. Loss of carbon (*left*) was 0.020 to 0.040 in. in depth. Carbon was restored (*right*) by a 2-hr treatment at 1700F and an atmosphere with 0.40% carbon potential

Case depths obtained in gas carburizing are a function of time, temperature and carbon potential. These factors are all critical, as indicated by Fig. 3.

NORMAL CARBURIZING

The case-depth curves shown for normal carburizing are obtained when the carbon potential of the furnace atmosphere is uncontrolled and the surface carbon represents saturated austenite. This varies from 1.30% C at 1700 F to 1.12% C at 1550 F, and is used mostly for low-alloy steels such as SAE 1020, B-1117, etc. Here the required surface characteristics are not critical. Mass-produced parts for lightly loaded mechanisms are carburized in this fashion.

CONTROLLED-CARBON CARBURIZING

Highly stressed parts are usually slow cooled and reheated for hardening. It is necessary to control the surface carbon below that of saturated austenite, to prevent an excess of carbide networks, which at the surface tend to pit in service and set up stress-raising points, or which give rise to grinding cracks.

Most highly stressed carburized parts are superior metallurgically if surface carbon is held between 0.80 and 0.95%. Typical steels are SAE 3312, 4615, 8620 and AMS 6250 and 6260 grades. Fig. 4 shows the results obtained for control of surface carbon in a cam made of SAE 1315 steel. Note the complete absence of carbide networks and massive carbides.

CARBON RESTORATION

By this process carbon in the decarburized surface is restored to the same concentration as in the core.

Cold-rolled or drawn steel bars and rod, as furnished by the mill, are usually decarburized on the surface. It has been common practice to purchase oversize stock and grind or machine off the decarburized layers before the finished part is made. This expensive expedient can be avoided by heat treating to restore the carbon. Also during fabrication, objectionable amounts of decarburization result in brazing operations, Fig. 5, and prevent obtaining proper hardening. The use of a 2-hr carbon restoration at 1700 F with a 0.40% carbon potential restored the carbon.

Fig. 6 shows a typical pit type carburizer. Here, the work is placed in a basket which is lowered into the furnace. The lid is replaced with the skirt seated in a sealing trough filled with zircon sand to prevent loss of atmosphere. Electric heating elements outside the retort provide the heat source. The carburizing media passes through an inlet tube in the lid and is drawn down through the work by the fan located in the bottom of the furnace. The atmosphere then is driven up between the work container and the retort and enriched by fresh carburizing media. The work is held at a constant temperature, which is measured by a thermocouple in the bottom of the furnace, for the required time, after which the work is removed and quenched in either brine or oil.

Fig. 7 shows a cross section of a batch-type horizontal carburizing furnace. Carburizing media enters through a tube in the top of the heating chamber. The load is held for the required time at the desired temperature and carbon potential. It is then pulled out of the furnace onto an elevator platform in the vestibule and lowered into an oil quench, which is an integral part of the furnace. Oil is pumped through the work to quench all parts at a uniform rate. The advantage of this type of furnace over the pit type is that the protective atmosphere in the vestibule prevents the work from being ex-

posed to air during transfer from furnace to quench. As a result the parts are clean or bright.

Continuous furnaces may be of several types. They are usually large box-type furnaces, which may be 50 ft long by 20 feet wide and the load is moved through the furnace on an alloy belt, or pushed on rails by hydraulic rams, or moved by a shaker hearth. There are usually three or four zones of temperature control, as required by the length of the furnace. The atmosphere is usually provided by natural gas or propane, which is used to enrich a carrier gas. As a rule these furnaces are fully mechanized.

CARBONITRIDING

Use of this process has increased appreciably since 1945, and many of the furnaces are fully mechanized. Applications of the process are chiefly to parts requiring a hard, wear-resistant surface, but where a shallow case ranging from 0.006 to 0.030 in. is adequate. Typical examples would be washers, spacers, bushings, forks, levers and similar sheet-metal stampings; also screws, bolts, shafts, bearing cups, gears and the like.

Furnaces used for carburizing are also used for carbonitriding. The ammonia and gas inlets for batch furnaces are usually at one location. For continuous-type furnaces several inlets are provided to distribute the gas through the length of the furnace.

Fig. 8 shows the cross section of a typical furnace where the work container is automatically moved into and out of the furnace and also automatically lowered into the quench oil under protective atmosphere.

In this process the presence of nitrogen lowers the transformation temperature and also reduces the transformation rate of martensite formation. Therefore, the process can be carried out at lower temperature than used for carburizing and the rate of quenching is not so critical. Less distortion occurs during the heating and cooling cycle, and hardness of parts is uniform. In addition, lower grade steels may be used than for carburizing, but adequate hardening

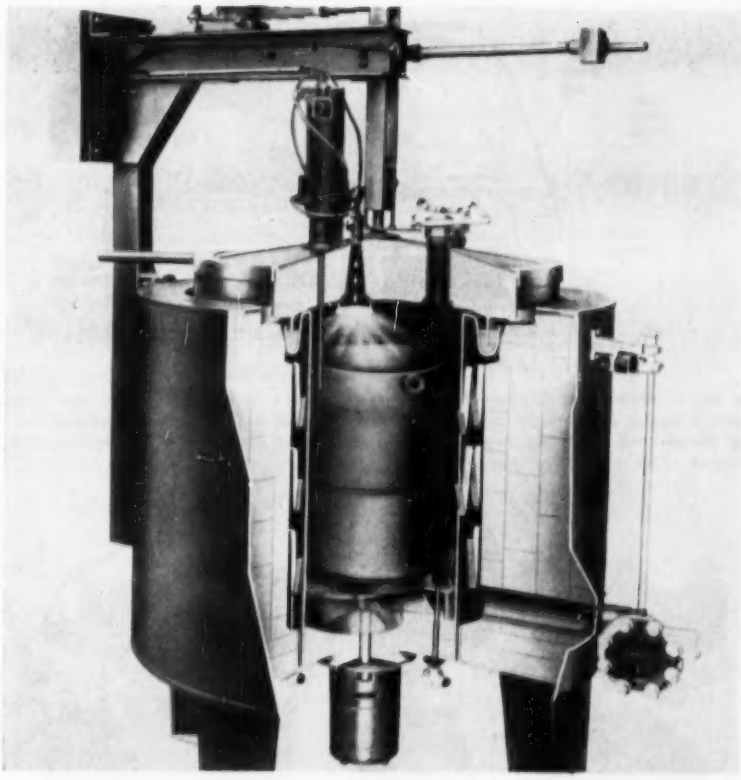


Fig. 6 . . Liquid carburizing medium is vaporized and thermally cracked above the hot work in this pit-type furnace. The atmosphere is drawn down through the charge by a fan and recirculated around the container, to be enriched by fresh carburizing media

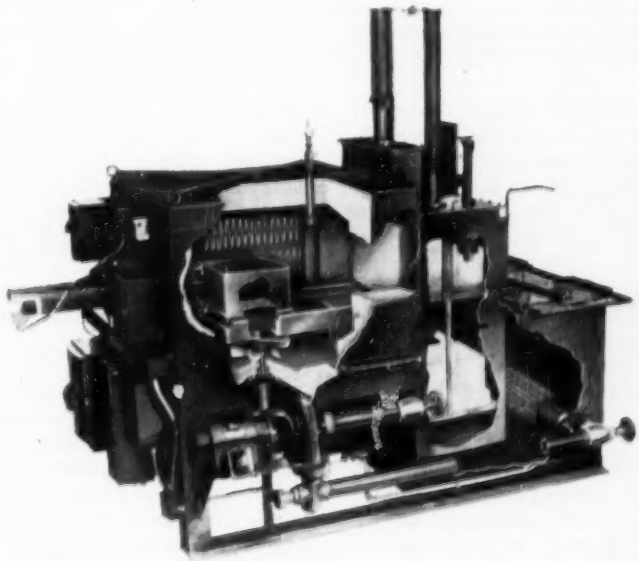


Fig. 7 . . Batch-type carburizing furnaces are virtually heat-treating machines. This one has cylinders that automatically open the furnace door and operate an elevator which lowers the container to an oil quench

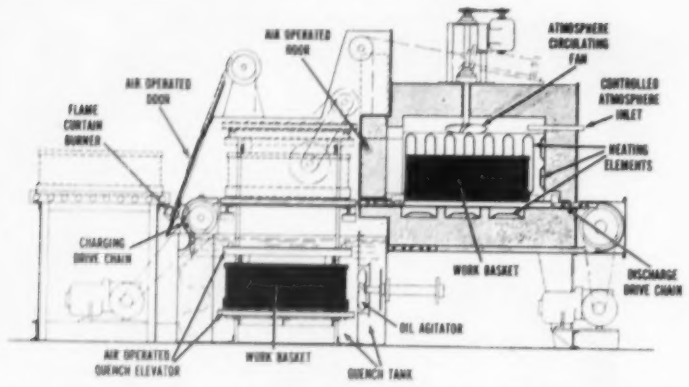


Fig. 8 . . Carbonitriding furnaces are similar to those used for carburizing. The work container is moved automatically into and out of the furnace and automatically lowered into the quench tank. Note the two air-operated doors that avoid loss of atmosphere and entrance of air

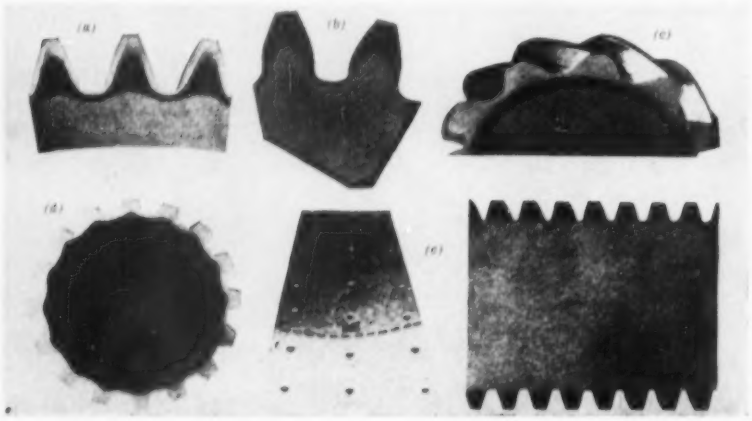


Fig. 9 . . Hardness patterns obtained with induction hardening depend on frequency and current flow, characteristics of steel and work-coil design. Typical variations are (a) contour hardening, (b) partial contour hardening obtained with preheating and final heating cycles, (c) spiral gear hardened below the root circle, (d) spline hardened below root circle, (e) lead-screw hardened below pitch line but above the root circle

can be obtained with an oil quench. Rate of case formation is approximately the same as for carburizing.

Temperatures used range from about 1250 to 1625 F with the more common usage being in the range of 1450 to 1600 F. The lower the temperature the greater the hardening effect of nitrogen. However, this hardening effect can become detrimental if a very brittle case is objectionable.

INDUCTION HARDENING

Heating rate and depth of penetration depend on the magnetic and electrical characteristics of the steel part, and on the frequency and magnitude of the current flowing in the inductor. Manufacturers of this type of equipment have available charts and nomographs which are used to determine all the necessary factors. The inductor-coil design is influenced by the shape of the part, the heat pattern desired, the number of parts to be heated and the power available.

Fig. 9 shows various hardness patterns obtained for gear teeth and screw threads.

Medium-carbon steels — 0.35 to 0.70% carbon—such as SAE 1045 and 1070 are used for parts to be induction hardened. Whether other alloys are required depends upon the hardenability required and the service conditions of the part. In some instances parts may be carburized before being induction hardened. In all cases, no surface decarburization can be tolerated, because the part will not surface harden.

SALT BATH FURNACES

The heating rate in salt baths is more rapid than in gas-atmosphere furnaces, because of the higher thermal conductivity of salt. When the parts are removed for quenching, a layer of salt often adheres to the part and freezes on it. This serves to prevent oxidation and scaling, and thus provides a part with a clean or bright surface. Washing operations are, of course, necessary to remove the salt layer after quenching. Quenching is usually done in water, brine or in a low-temperature salt bath.

Distortion of the part is held to a minimum in salt baths for two reasons. First, when the cold part is immersed in the salt, a layer freezes to reduce thermal shock. Second, the buoyant effect of the salt tends to give the part some support, but requires that light parts be fixtured so that they will be forced down ino the bath.

When salt baths are used for carburizing, the temperatures range from 1550 to 1750 F, and the case depths can be varied from 0.005 to 0.125 in. This is much the same as in gas carburizing. However, there must always be some nitrogen in the case because of the presence of active nitrogen from decomposition of the cyanide. This is not normally disadvantageous.

When used for cyaniding, salt-bath temperatures range from 1300 to 1550 F, and the case depth is usually no greater than 0.010 in.

The composition of the salt baths vary widely depending upon the temperature, alloy being treated and the case depths desired.

Furnace size may vary from a small, round pot to large rectangular mechanized units. In one case a carrousel type of mechanized unit charges work into three baths spaced in a circle, using a centrally located mechanism that provides both vertical and circular motion. Mechanized arrangements may be custom engineered.

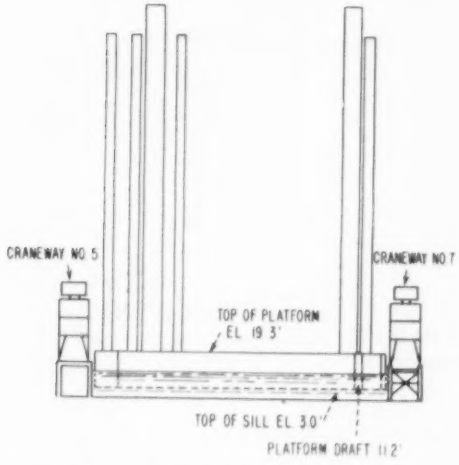
Acknowledgements for use of illustrations are made to: Ajax Electric Co, American Society for Metals, Leeds & Northrup Co, and Lindberg Engineering Co.

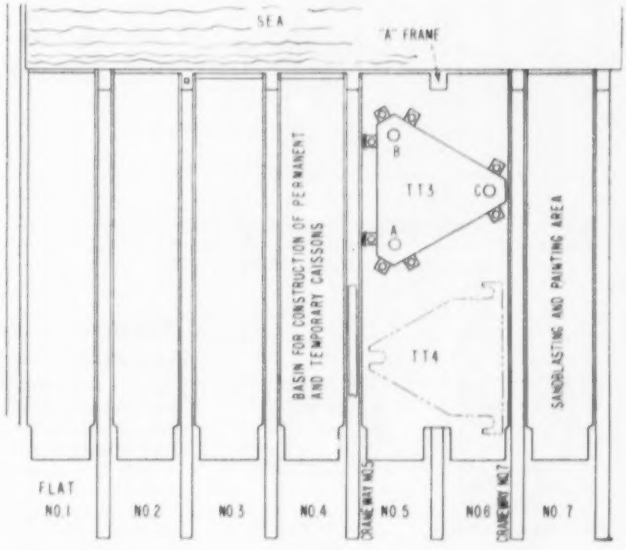
Metalworking goes to sea . . .

STRENGTHENING OUR COASTAL DEFENSES

Building the 6250-ton TT3 in record time, and at a cost of $8½ million, required some unusual feats of engineering (AM—August 25, '56 p 134). Here are the exclusive details of other outstanding accomplishments covering shortcuts in adaptation, fabrication, construction methods, and the erection sequence at sea of TT4 in 1957

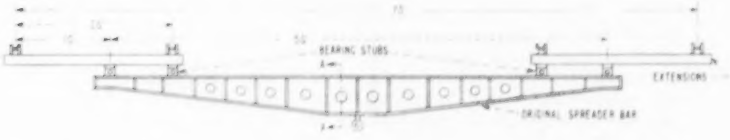
WILLIAM D MILLER, assistant vice-president CONTINENTAL COPPER & STEEL IND. INC. NEW YORK CITY
as related to JOHN P WRIGHT, associate editor

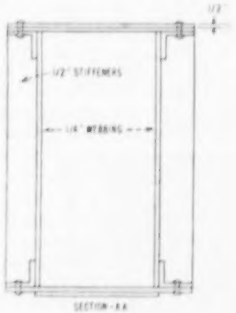


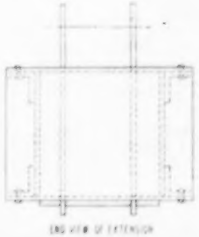


Extensive planning was undertaken . . .

to adapt existing facilities of the shipbuilding yard to hold costs down. First step was to remove craneway No *6* to provide the necessary span (177 ft) for nesting platforms No *3* and *4*. Pumphouse No *6* was removed and replaced with an A-frame which could be swiveled out of the way during launching operations. A special bulkhead also had to be constructed to hold back a 13-ft deep sea. Because craneway No *6* was removed, four 25-ton cranes on ways *5* and *7*, idle since 1945, were completely reconditioned and coupled to a spreader bar for spanning the full width of the basin. Cranes and spreader bar transported subassemblies to any position of the basin

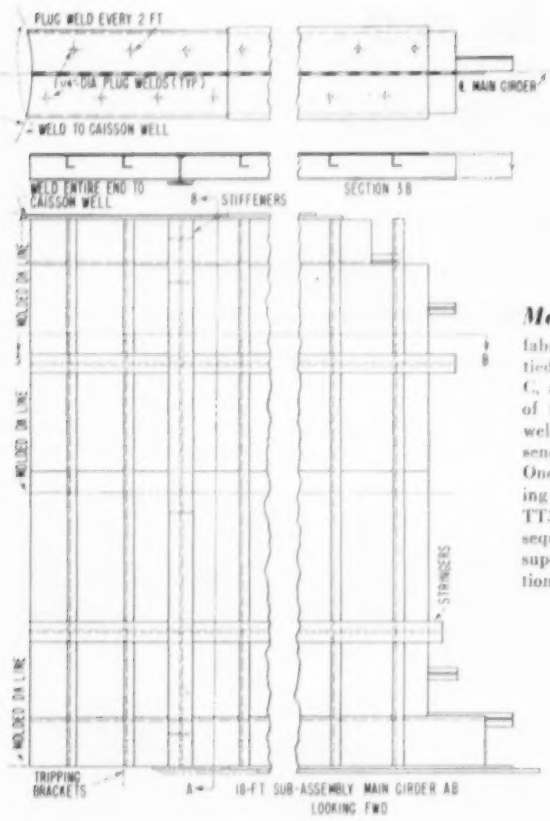


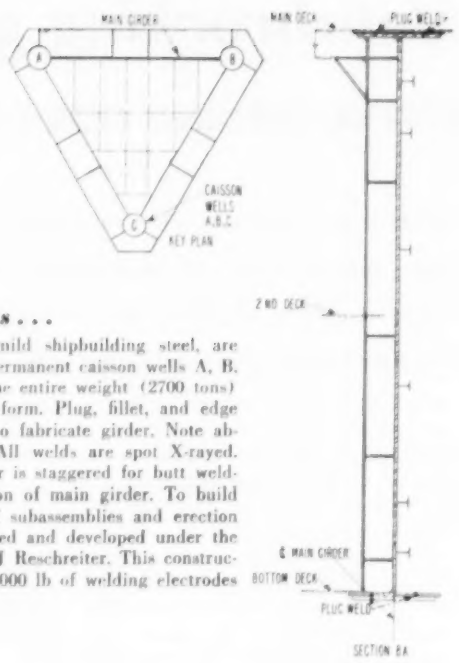




Original 50-ton spreader bar . . .

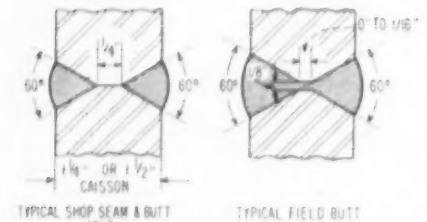
was redesigned for a 70-ft span to fill the void existing between the cranes when fully extended from each side of the basin. Modified bar now has a lifting capacity of 35 tons. This is another example of how adapting existing facilities helped to conserve costs and manhours

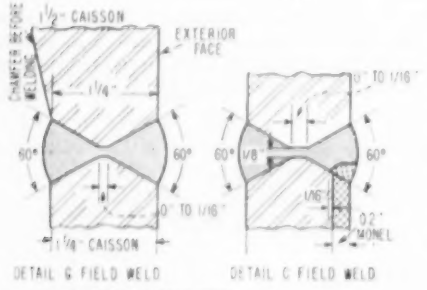


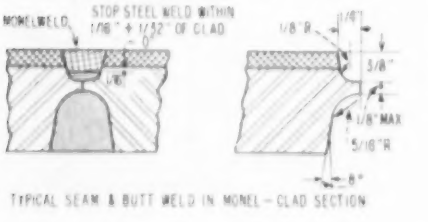


Main girders . . .

fabricated from mild shipbuilding steel, are tied-in between permanent caisson wells A, B, C, and support the entire weight (2700 tons) of the tower platform. Plug, fillet, and edge welding is used to fabricate girder. Note absence of rivets. All welds are spot X-rayed. One end of girder is staggered for butt welding to next section of main girder. To build TT3, a system of subassemblies and erection sequences was used and developed under the supervision of R J Reschreiter. This construction required 167,000 lb of welding electrodes

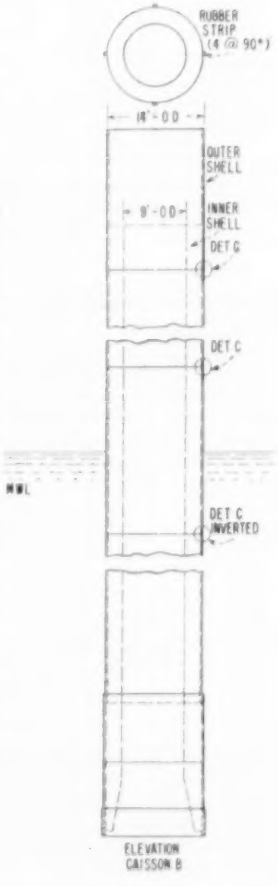


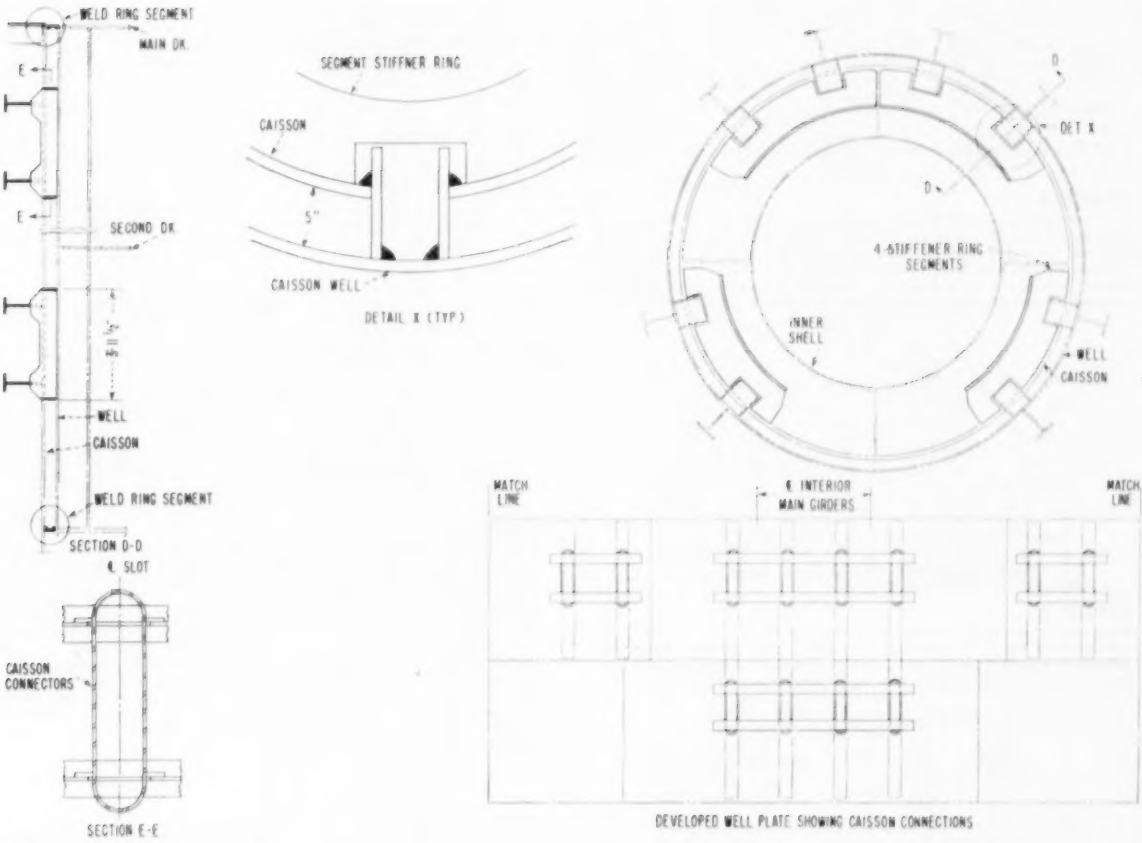




Fabrication details of 500-ton permanent caissons . . .

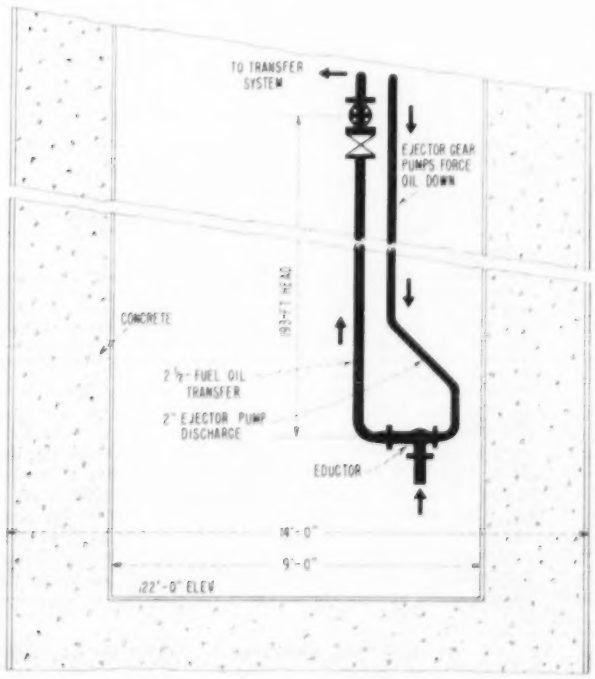
indicate shop and field welds required during various stages of subassemblies. Note preparation of joints adjacent to 0.20-in. thick monel-clad plating which was integrally bonded to outside face of caisson. Plating extended 5 ft below mean water line and 20 ft above mwl for protection against spray and waves. Inner shell is rolled from ½-in. plate while outer shell is rolled from 1½-in. plate. Subassemblies of permanent caissons 25 ft long are shop welded by the automatic submerged-arc method. At the basin site, they are hand welded together into 50 ft lengths from previously prepared seams illustrated in the typical field butt weld, steel to steel, steel to monel, and monel to monel. Because the shop seam offers greater penetration, the butt is ¼ in. wide, while hand-welded seams, offering less penetration, call for a 1/16-in. max butt. Low-hydrogen welding electrodes were used exclusively to assure ductile seams. Electrodes, 6020, were used for seams on outer shell, and 6010 for seams on inner shell. All welded joints of permanent caissons were X-rayed 100%. Rubbing strips, used for lowering and raising the caissons, were primarily designed to protect the bituminous painting on OD of caisson





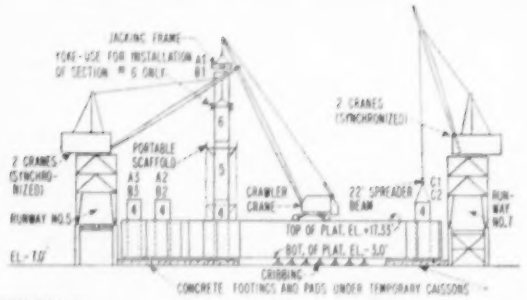
Shear and moment forces . . .

are offset by welding 12 oval connectors (shear) and segment rings (moment) between the main girder well and the caisson. Welding the connectors and segments in position is performed after permanent caissons are sunk, and the platform raised into position, but supported on the temporary caissons. Openings for the connectors are burned through the caisson and welded between well and caisson as shown in detail X. Section DD shows additional ring segments welded completely around top and bottom of well



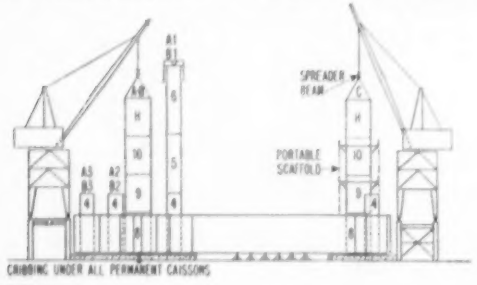
Fuel oil . . .

with a head of 193 ft, is stored in caissons A and B for servicing the diesel generators and ships. It is recovered at the rate of 15 gpm by using the principle of the venturi tube. Two high-pressure ejector pumps force oil down through the first line and horizontally across the eductor. The eductor consists of a venturi nozzle and a diffuser with ports in the throat directed to the tank. Oil flowing past the eductor is accelerated and reduced in pressure as it passes through the throat. Because pressure in the throat is below that in the tank, oil enters through the venturi tube and mixes with the continuous flow. Pressure head required to lift oil from the tank is produced by decelerating flow of oil in the diffuser. Fire protection is afforded by an automatic foam system atop the caissons. Note that space between all inner and outer caisson shells is eventually filled with concrete



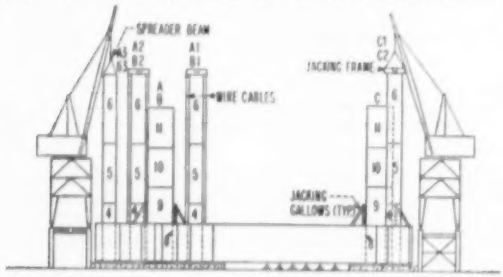
STAGE 1 . . .

Concrete pads support temporary caissons. Install section *4*, *5* and *6* of caissons *A1* and *B1*, using cranes with spreader beam for sects *4* and *5*, and yoke for sect *6*. Erect portable scaffold at each caisson well to permit exterior welding, and place working platform in caisson sections to permit interior welding, as work progresses. Install jacking frame and cables for caissons *A1* and *B1*, using crawler crane on platform. Install sections *4*



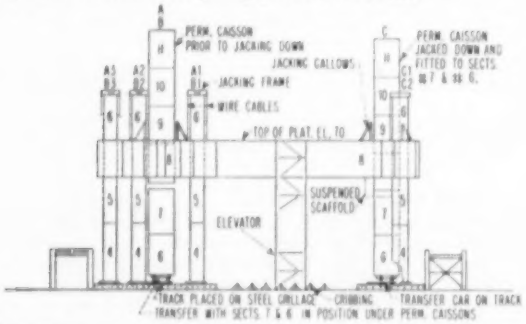
STAGE 2 . . .

Using two cranes with spreader beam, install sections *8*, *9*, *10* and *11* of caissons *A*, *B* and *C* to initial length of 84 ft. Erect portable scaffold for permanent caisson (interior and exterior) to permit welding as work progresses. Install track supports and track outside area of platform



STAGE 3 . . .

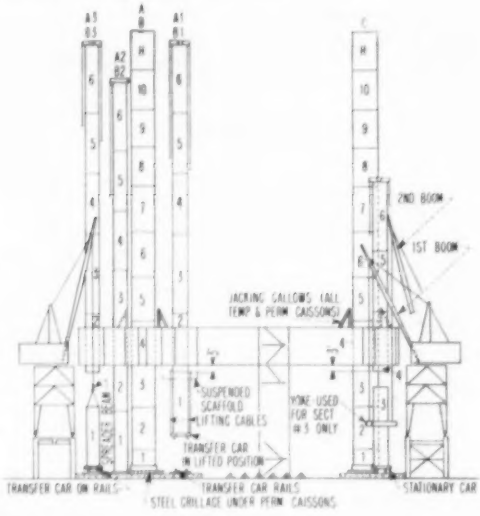
Complete installation of caissons *A2*, *B2*, *A3*, *B3*, *C1* and *C2*,—sections *5* and *6*, using two cranes and spreader beam, to initial length of 101 ft 4 in. Install jacking frames and wire cables on temporary caissons *A2*, *B2*, *A3*, *B3*, *C1* and *C2*. Place jacking gallows at all caissons


PERM. CAISSON PRIOR TO JACKING DOWN
JACKING GALLOWS
JACKING FRAME
WIRE CABLES
TOP OF PLAT. EL. TO
PERM. CAISSON JACKED DOWN AND FITTED TO SECTS. 7 & 6.
SUSPENDED SCAFFOLD
ELEVATOR
TRACK PLACED ON STEEL GRILLAGE
CRIBBING
TRANSFER CAR ON TRACK
TRANSFER WITH SECTS. 7 & 6 IN POSITION UNDER PERM. CAISSONS

STAGE 4 . . .

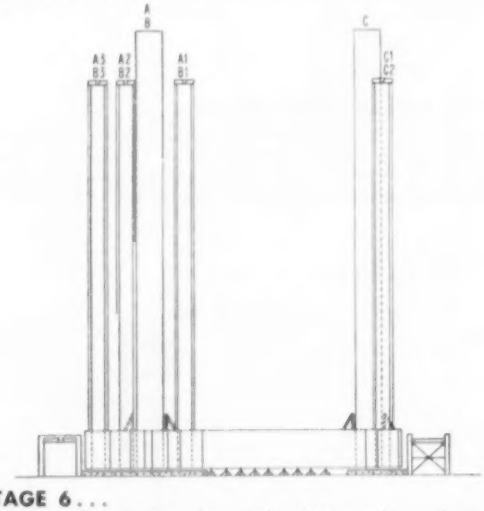
Raise platform on temporary caissons *A1*, *A2*, *B1*, *B2*, *C1* and *C2*. Using jacking gallows, jack up permanent caissons *A*, *B* and *C* until bottom of section *8* of caissons protrudes 3 ft below bottom of platform. Lock in position. Erect grillage and place track under all permanent caisson wells. Erect elevator, and suspended scaffold at caisson wells. Move transfer cars with previously joined sects *7* and *6* (having an interior work platform) into positions under permanent caissons. Wedge up transfer cars. Unlock and jack down permanent caissons on top of joint sects *7* and *6* and make required connection to sect *8*. Jack up permanent caissons allowing sect *6* to protrude from bottom of platform. Lock caissons and remove transfer cars. Repeat installation procedure for joint sects *5*, *4*, *3*, *2* and *1*. Remove tracks at permanent caissons and place at temporary caissons

Metalworking goes to sea . . .


2ND BOOM
1ST BOOM
JACKING GALLOWS (ALL TEMP. & PERM. CAISSONS)
SUSPENDED SCAFFOLD LIFTING CABLES
YOKE USED FOR SECT #5 ONLY
TRANSFER CAR IN LIFTED POSITION
TRANSFER CAR ON RAILS
TRANSFER CAR RAILS
STEEL GRILLAGE UNDER PERM. CAISSONS
STATIONARY CAR

STAGE 5 . . .

Using jacking gallows, jack down permanent caissons *A*, *B* and *C*, until they rest on steel grillage, and lock in place. Platform load to be carried by permanent caissons. Jack up temporary caissons using jacking gallows until sect *4* protrudes 3 ft below bottom of platform. Erect suspended scaffolds at each temporary caisson well to permit exterior welding, and provide interior welding platforms in each of the remaining temporary caisson sections. Place sect 3 of temporary caissons *A1*, *B1*, *A3*, and *B3* on transfer cars with spreader beam and move cars under caissons. Lift cars with cables from jacking gallows and join sect *3* with protruding sect *4*. Place sect 3 of *B2*, *A2*, *C1* and *C2* on stationary cars under caissons using yoke. Remove yoke and complete installation using method described above. Repeat installation procedure for sects *2* and *1*, using spreader beam instead of yoke



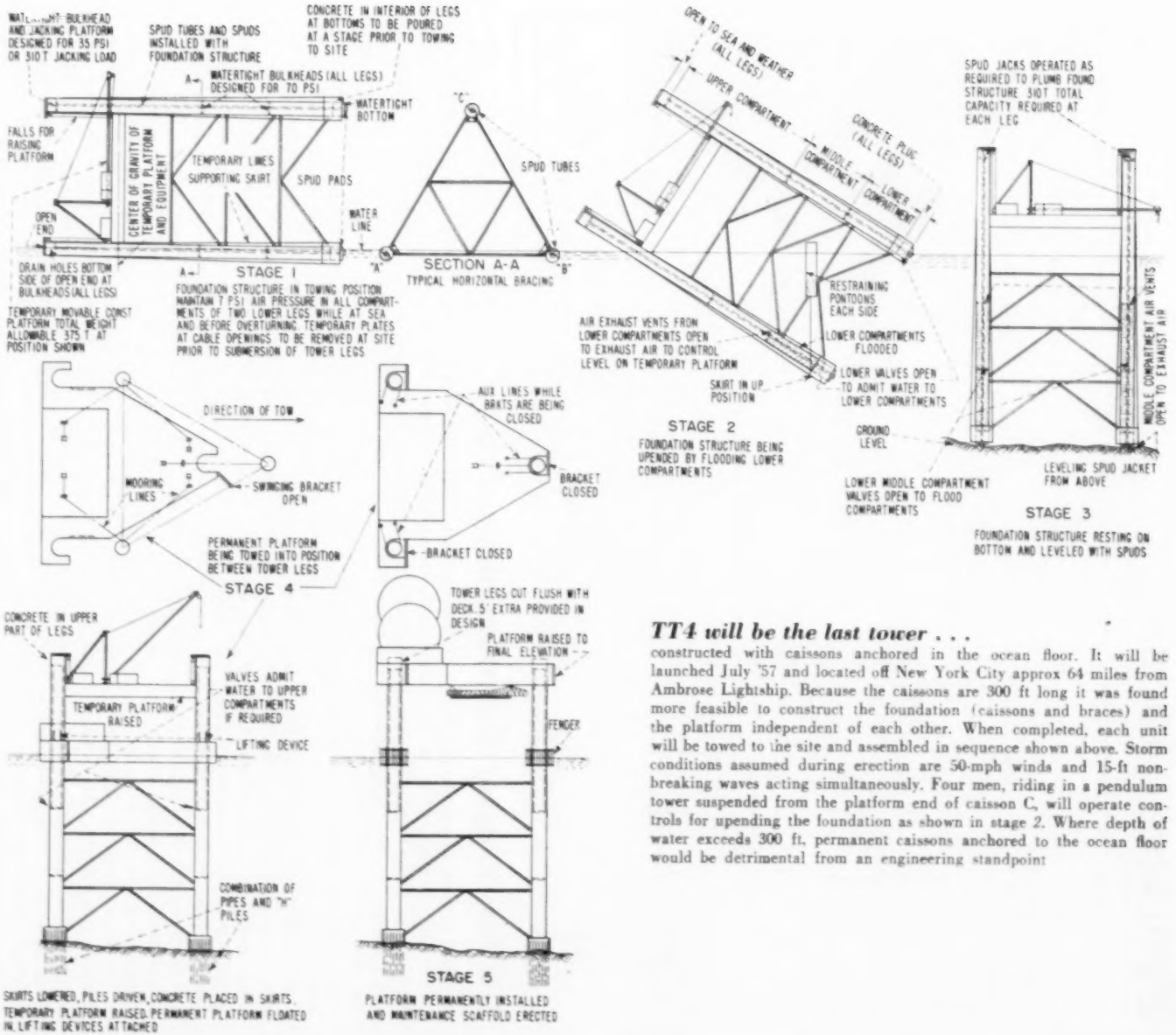
STAGE 6 . . .

Jack down all temporary caissons using jacking gallows. Engage all jacking devices of temporary caissons and release locking device of all permanent caissons. Remove elevator, tracks, transfer cars, etc. Jack down platform on all temporary caissons until load of platform is transferred to the main girders *AB*, *BC* and *AC*. Lock all caissons and provide necessary bracing of caissons as may be required during towing. Remove all remaining equipment prior to flooding of basin

Six basic steps . . .

were required for the erection of the 237-ft permanent and the 208-ft temporary caissons. Welding individual sections of the caissons in place required seven passes and from four to six welders. After welding of each permanent caisson section, the weld was X-rayed using a cobalt 60-10 curie pill in 1 hr 37 min. Film was wrapped around the outside bead, and by remote control the cobalt pill was fed from an 800-lb lead box up inside the caisson to the camera. During the X-ray operation all personnel

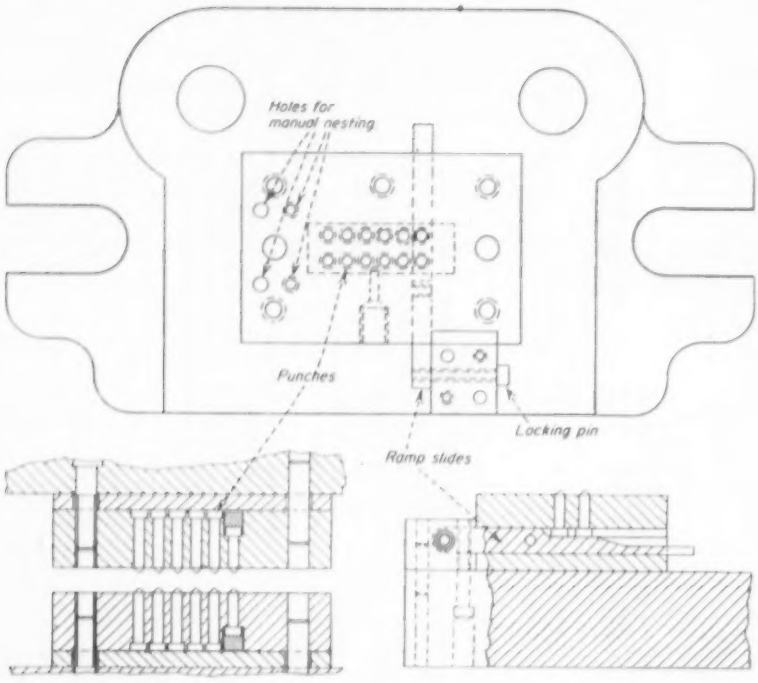
were cleared to an area beyond a 40-ft radius of caisson. Tracks and cars erected in Stage 4 are precisely aligned to centerline of caissons. Following stage 6 the basin is flooded as the trial high tide begins to fall. At low tide when waters are equalized, the gates are removed and A-frame swiveled downward below the sill. As high tide starts to rise, the crawler cranes, which remain with the TT, are used to trim the platform. Three quarters of an hour before high tide, the platform is eased out to sea, drawing 11½ ft of water and permitting 2 ft max clearance over basin sill. From this point the tower is towed to a state pier where provisions, fuel, and cement are taken aboard. Next stop is the ocean site. Successful handling of foundations and installations of caissons is credited to Bruno Garunkstis. Alterations to yard and launching operations for TT3 is credited to Joseph Albicz


WATERTIGHT BULKHEAD AND JACKING PLATFORM DESIGNED FOR 35 PSI OR 310 T JACKING LOAD
SPUD TUBES AND SPUDS INSTALLED WITH FOUNDATION STRUCTURE
CONCRETE IN INTERIOR OF LEGS AT BOTTOMS TO BE POURED AT A STAGE PRIOR TO TOWING TO SITE
WATERTIGHT BULKHEADS (ALL LEGS) DESIGNED FOR 70 PSI
WATERTIGHT BOTTOM
FALLS FOR RAISING PLATFORM
CENTER OF GRAVITY OF TEMPORARY PLATFORM AND EQUIPMENT
TEMPORARY LINES SUPPORTING SKIRT
SPUD PADS
SPUD TUBES
OPEN END
WATER LINE
DRAIN HOLES BOTTOM SIDE OF OPEN END AT BULKHEADS (ALL LEGS)
TEMPORARY MOVABLE CONST PLATFORM TOTAL WEIGHT ALLOWABLE 375 T AT POSITION SHOWN
STAGE 1
FOUNDATION STRUCTURE IN TOWING POSITION MAINTAIN 7 PSI AIR PRESSURE IN ALL COMPARTMENTS OF TWO LOWER LEGS WHILE AT SEA AND BEFORE OVERTURNING. TEMPORARY PLATES AT CABLE OPENINGS TO BE REMOVED AT SITE PRIOR TO SUBMERSION OF TOWER LEGS
SECTION A-A
TYPICAL HORIZONTAL BRACING
OPEN TO SEA AND WEATHER (ALL LEGS)
UPPER COMPARTMENT
CONCRETE PLUG (ALL LEGS)
MIDDLE COMPARTMENT
LOWER COMPARTMENT
AIR EXHAUST VENTS FROM LOWER COMPARTMENTS OPEN TO EXHAUST AIR TO CONTROL LEVEL ON TEMPORARY PLATFORM
SKIRT IN UP POSITION
RESTRAINING PONTOONS EACH SIDE
LOWER COMPARTMENTS FLOODED
LOWER VALVES OPEN TO ADMIT WATER TO LOWER COMPARTMENTS
GROUND LEVEL
LOWER MIDDLE COMPARTMENT VALVES OPEN TO FLOOD COMPARTMENTS
STAGE 2
FOUNDATION STRUCTURE BEING UPENDED BY FLOODING LOWER COMPARTMENTS
SPUD JACKS OPERATED AS REQUIRED TO PLUMB FOUND STRUCTURE 310T TOTAL CAPACITY REQUIRED AT EACH LEG
MIDDLE COMPARTMENT AIR VENTS OPEN TO EXHAUST AIR
LEVELING SPUD JACKET FROM ABOVE
STAGE 3
FOUNDATION STRUCTURE RESTING ON BOTTOM AND LEVELED WITH SPUDS
DIRECTION OF TOW
MOORING LINES
SWINGING BRACKET OPEN
AUX LINES WHILE BRATS ARE BEING CLOSED
BRACKET CLOSED
BRACKET CLOSED
PERMANENT PLATFORM BEING TOWED INTO POSITION BETWEEN TOWER LEGS
STAGE 4
CONCRETE IN UPPER PART OF LEGS
VALVES ADMIT WATER TO UPPER COMPARTMENTS IF REQUIRED
TEMPORARY PLATFORM RAISED
LIFTING DEVICE
COMBINATION OF PIPES AND "H" PILES
SKIRTS LOWERED, PILES DRIVEN, CONCRETE PLACED IN SKIRTS. TEMPORARY PLATFORM RAISED. PERMANENT PLATFORM FLOATED IN, LIFTING DEVICES ATTACHED
TOWER LEGS CUT FLUSH WITH DECK. 5' EXTRA PROVIDED IN DESIGN
PLATFORM RAISED TO FINAL ELEVATION
FENDER
STAGE 5
PLATFORM PERMANENTLY INSTALLED AND MAINTENANCE SCAFFOLD ERECTED

TT4 will be the last tower . . .

constructed with caissons anchored in the ocean floor. It will be launched July '57 and located off New York City approx 64 miles from Ambrose Lightship. Because the caissons are 300 ft long it was found more feasible to construct the foundation (caissons and braces) and the platform independent of each other. When completed, each unit will be towed to the site and assembled in sequence shown above. Storm conditions assumed during erection are 50-mph winds and 15-ft nonbreaking waves acting simultaneously. Four men, riding in a pendulum tower suspended from the platform end of caisson C, will operate controls for upending the foundation as shown in stage 2. Where depth of water exceeds 300 ft, permanent caissons anchored to the ocean floor would be detrimental from an engineering standpoint

Practical Ideas . . .



Die Does Faster Countersinking Job

A faster method of countersinking was needed. In pieces of ⅜-in. aluminum, one batch with ten holes, and the other twelve, both ends of the holes had to be countersunk, before tapping, in order to keep tap breakage down.

Production was speeded up satisfactorily with the use of the die illustrated. It is mounted in a press with a B&O dial feed. The operator thus feeds the dial table and the mechanical arm feeds the die, directly nesting the pieces on the punches.

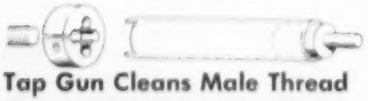
We have made provisions for nests on the die when mounted in a press not equipped with dial feed. Note the two 10-32 tapped holes and two 3/16-in. dowel holes.

The die was designed to countersink both sides of either piece in one stroke of the press. By moving the ramp slides on both the upper and lower halves of the die, four punches can be engaged or disengaged, depending on which piece is to be processed.

Two spring-loaded pins will eject the parts, should they adhere to the upper half of the die, and a jet of air will strip the parts off the lower half of the die.

Since metal is not being removed in this process, but rather displaced and depressed, it is partially forced into the hole but not enough to cause any tapping difficulty.

Nicholas Costa, West Peabody, Mass



Tap Gun Cleans Male Thread

We are using a tap gun to drive a standard round threading die. Its purpose is to clean solder out of ¼-20 machine screws, 2½-in. long. These screws are anchored with solder, and the capillary action moves solder and flux 3 to 4 threads up the screw. The location of these screws is in such close quarters that the use of a stock or handle is impossible.

The adapter shown works very well. The shank is held in the tap-gun chuck, while two prongs engage a pair of the holes in the die. After the die has been started on the screw by hand, the adapter is applied and die is run down the full length of the screw.

Thus the thread cleaning is done in far less time and with less effort.

Samuel Panansky, Belleville, N J

Extension Rods Expand Telescoping Gage Capacity

The telescoping gage is most often used for internal measurements of round holes or bores, but each gage has only a limited range of measurement. These rods will extend the capacity of one gage to take the place of a number of larger-size gages. This is a big saving over purchasing of a full set, or when the largest is a bit too small.

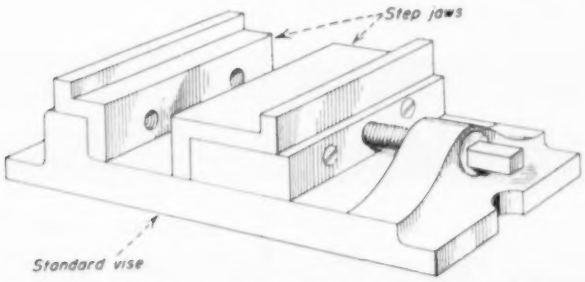
The rods are easily made from 5/16-in. drill rod. Chucked in the lathe, they are drilled and reamed to fit over either leg of the gage. It may prove to be more convenient to choose a leg of a standard diameter. On some of the most commonly used gages, this is 3/16-in.

The contact end of the extensions should be slightly crowned or spherical for proper contact with the I D surface, and should also be polished to remove all tool marks.

As this tool is used only for transferring measurements from work to micrometer, the lengths of the extensions do not have to be of precision measurements. The holes need only be deep enough for a wobble-free fit.

Hardening of the rods is not necessary, but is desirable to prevent damage.

H J Gerber, Stillwater, Oklahoma



Step Jaws Increase Capacity Of Vise

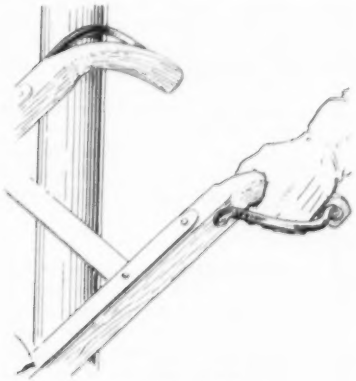
One of the most convenient and most often used methods of holding work on a milling machine is by gripping it in a vise. The one drawback is its limited holding capacity. Every shop has faced this reality and has had to resort to other methods of holding the work.

Mechanics are known to remove one or both of the hardened jaws in order to stretch the vise capacity. This is of course a bad practice, and can be discarded with the use of the illustrated step jaws.

By replacing the regular jaws with these step jaws, the capacity of the vise can be increased 100%. Small work can thus be held in the regular manner, and the larger work in the upper part of the jaws.

This will eliminate the necessity of removing the vise and strapping the work to the table when the work is only slightly bigger than the ordinary jaws can handle.

Ottavio Cerullo, East Boston, Mass



Guard Saves Knuckles

We have a number of hand trucks that we use for transporting a variety of material around the shop and plant. In order to make the handling of these trucks a little safer we have added a hand guard to each handle.

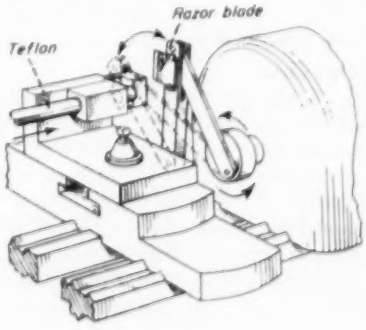
It is simply a curved steel strap, screwed or riveted onto the outside of the grips. So far they have prevented many bruised knuckles which might have resulted from scraping against doorways and machines.

Ernest Jones, Bronx, N Y

Fixture In Lathe Cuts Teflon Without Waste

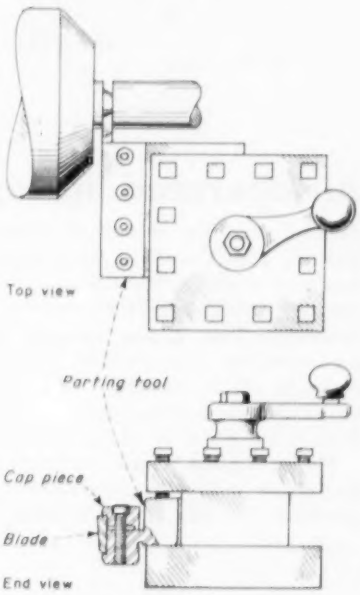
Several hundred feet of ⅜-in. dia Teflon had to be cut into ⅜-in. lengths, but since the cost of this material is high, our aim was to keep waste to a minimum. A practical solution was found by using a simple setup in a small lathe.

A small angle plate was mounted on the cross-slide compound, supporting a feed block, with a ⅜-in. hole and a stop. A heavy-back razor blade was secured to a vertical bar, one end hinged at the base of the angle plate. The other end of the bar was fastened to a link coupling it with an eccentrically functioning plate. This plate is held in the headstock collet.



The depth of the stroke can be adjusted by the cross-slide controls. Speeds can be selected and increased in accordance with the operator's adeptness. The only requirement is to keep feeding the material against the stop as each piece drops off.

Karl Haller, Millington, N J



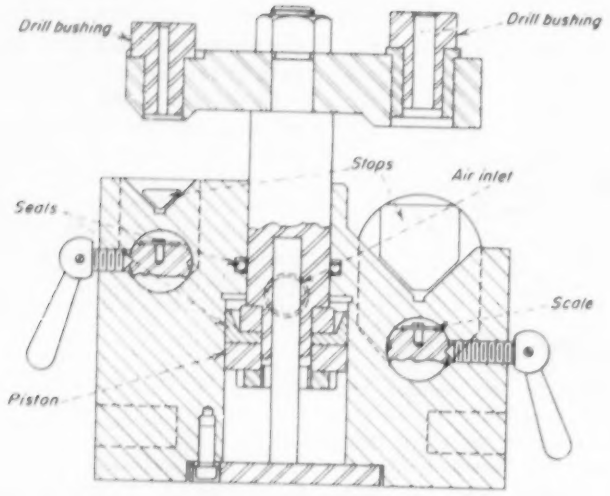
Cutoff Toolholder Parts Work Close To Collet

This toolholder was designed for heavy duty cutoff work which had to be done close to the collet or chuck. It is held in the square turret, and its design affords a more rigid mounting than the usual cutoff toolholder.

The body is made by bandsawing an "L" shaped piece out of heavy steel plate. Then it is finished by milling to shape and size to fit the turret, so it can be rigidly held by the hold-down screws on two adjacent sides.

The cutoff blade is seated in a slot along the side of the outer edge of the body, and is held by a cap piece, machined as shown, with hollow-head capscrews securely tightened.

H J Gerber, Stillwater, Oklahoma



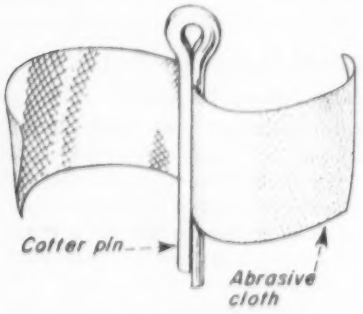
Air-operated Jig Replaces Many Fixtures

Making this jig is not a small project, but it may in time save you a lot of money and delays necessary in making drill fixtures for individual jobs. It has a capacity for accepting any diameter from ¼ in. to 1¾ in. inclusive, and the range of drills and reamers extends from 1/16 in. to 17/32 in.

The drill plate is case hardened, and a thin-wall removable liner is provided for the larger bushing, which has a ¾-in. body, allowing drills of that size to be used.

Each stop rod employs a standard 12-in. scale, fastened on top of the rod for quick and fairly accurate settings. Locking screws on sides serve two purposes: positive locking of the stop bar, and when loosened act as guides, preventing rotating of bars.

John Horan, Croydon, Surrey, England



Abrasive Cloth In Cotter Pin Laps Bushing

I had several small bushings that, after having been pressed into place, were just a bit too snug. Not having any laps to fit this particular size hole, I thought I'd try a piece of abrasive cloth threaded through a cotter pin, to merely polish the inside of the bushing.

A small air grinder supplies the power. Since these grinders operate at a very high speed, it is best to observe a couple of safety precautions, namely: Before turning on power, abrasive cloth must be wrapped tightly around cotter pin and inserted into bushing. Secondly, allow grinder to stop before extracting pin from bushing.

The reason for these precautions is that at this high rate of speed the cotter pin will have a tendency to bend. Care should also be taken to make sure that none of the abrasive is left in the bushing.

Chas E Wolfe, Brisbane, Calif

Two Screws Are Better Than One

On equipment where vibration continually loosens a vitally important setscrew replace the original screw with two short ones. Tighten one of the setscrews as usual, then run the second one down on top of it, locking both.

Stanley Clark, East Bradenton, Fla

Winner No. 254

H J GERBER

won $25 in addition to regular payment for his idea:

EMERGENCY ARBOR

in the issue of July 2, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

American Machinist

SPECIAL REPORT NUMBER 431

ARC-CAST MOLYBDENUM

. . . . new material with a big potential

High-temperature strength and great stiffness make arc-cast molybdenum a good possibility for the gas turbines, jet engines, and hot-work dies of the near future. Arc casting turns out a metal with higher density and better machining qualities than the older powder-metal form of molybdenum. At a time when considerable experimental work is being done on this relatively new material, we present an unusual Special Report consisting of five separate articles; three case studies on how turbine wheels have been machined, a report on laboratory and shop tests of the metal as a boring-bar material, and a summary of the latest data on machining techniques and recommendations.

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1.. MACHINING ARC-CAST MOLYBDENUM IS EASY, IF . .

. . . if you follow a few basic precautions that apply specifically to this relatively new form of molybdenum. Following is the latest machining data, gathered from laboratory and field tests

ROBERT R FREEMAN, manager; and DR J Z BRIGGS, director;
Technical Information; Arc-Cast Development, CLIMAX MOLYBDENUM CO

Arc-cast molybdenum isn't quite the same material as the older powder-metal variety. For one thing, it's denser; but it is easier to machine. It has less tendency to spall and crack in thin sections, welds better, and cuts to a better finish. Both types of molybdenum have outstanding high-temperature qualities, compared to steel; and both are more abrasive.

After mechanical working, the arc-cast metal is relatively hard—in the 196-275 Bhn range, usually from 200-220. Prior treatments have little effect on machinability. It is presently available unalloyed and in four commercial alloys; all machine about the same as the unalloyed metal.

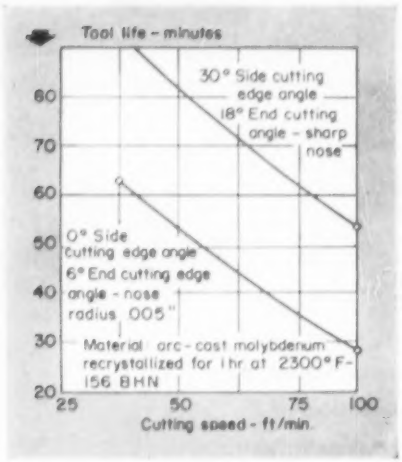
CAUTION FIRST

Abrasion is a factor in machining the material. Molybdenum chips can ruin a good drill if they aren't cleared properly; which means one of three things—upside-down drilling, repeated relieving, or high-pressure coolant to flush chips out rapidly.

Another point for special care is contamination, particularly in connection with coolants. In many applications, such as vacuum-tube elements, molybdenum parts must have chemically pure surfaces. Sulfur-base oils readily contaminate the metal, but chlorinated oils do not. Therefore, a good coolant for such cases is a 50/50 mixture of chlorinated oil and trichlorethylene. If surface condition is not a factor, sulfur-base oils do a good cooling job, too.

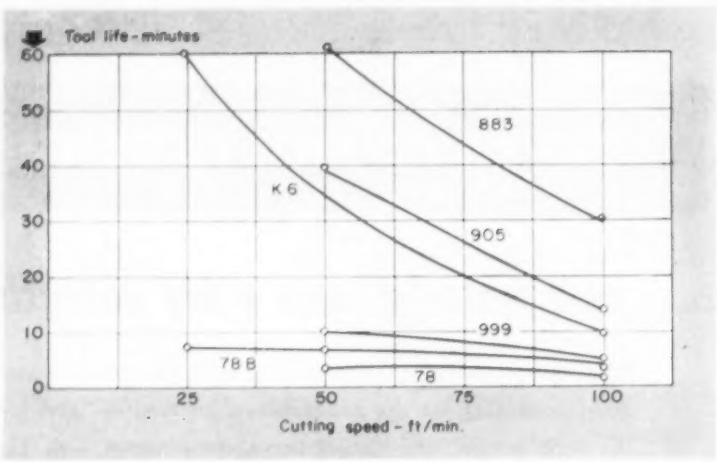
Cutting speeds for molybdenum generally cover a narrow range. Too-fast cutting wears tools.

1.. MACHINING ARC-CAST MOLYBDENUM IS EASY, IF..



TOOL GEOMETRY MAKES SHARP DIFFERENCE . . .

. . . in tool life. Grade 883 carbide cut recrystallized arc-cast molybdenum with 0.03-in. depth of cut; same feed, coolant, rakes, and relief as in tool-life tests charted at right. Sharp tool nose promotes better life for semi-finishing, but 0.01-in. nose radius and 0.01-in. depth of cut improves surface from 80 to 40 mu in. for finishing



TOOL-LIFE TESTS WITH CARBIDES . . .

. . . showed three grades far superior, with best life at 25-50 sfpm. Material was stress-relieved molybdenum, cut at 0.002 ipr to depth of 0.03 in., and with coolant mixture of 50:50 Cut-Max 569 and trichlorethylene. Tool geometry was same as sketched on next page except that side cutting-edge angle was 0, end cutting-edge angle was 6°, and nose radius was 0.005 in.

and too-slow cutting produces poor surface finish. Therefore, some care is necessary in getting the right cutting speeds for best results.

TOOLING MATERIALS

HSS and sintered carbides both work well on arc-cast molybdenum; but cast cobalt-base alloys have not worked out. HSS wears rapidly, but if the setup is firm, it will cut well in roughing work even if the edge is on the dull side. Tool angles and rake are about the same as for cast iron. Work should be firmly chucked, tools should be sharp and well supported, and machines should be rigid and free from backlash. These are common enough machining recommendations; but they have more importance with molybdenum than with ordinary steels.

HSS bandsaws and hacksaws do a good job. Speeds should be lower than for steel, but no coolant is required.

Warm shearing is a good technique on arc-cast molybdenum up to 0.05 in. thick. Heavier stock should be edge-machined with a shaper or miller; or cut off with an abrasive wheel or a bandsaw. Flame cutting is not recommended; molybdenum melts, but doesn't burn, and leaves an irregular edge.

TURNING TO GOOD FINISH

Chip curling is an important index to good machining with HSS tools on molybdenum. A lathe tool with generous rake, and the tip higher than the shoulder, will curl chips properly and produce a good finish. For roughing, especially on heavy ingot and extrusion sections, HSS is the tooling material to use. Cutting speed should be from 45 to 55 sfpm, with 0.010-0.020-ipr feed and ¼-in. depth of cut. If stock for roughing isn't too irregular, carbide tools can be used, with a coolant, at about five times this cutting rate.

Finishing is slower; much slower. Molybdenum is a material that improves in surface finish as the cutting speed is reduced. Carbide tools should run at 25-50 sfpm, with a feed of 0.002 ipr—with coolant.

SHAPING AND MILLING

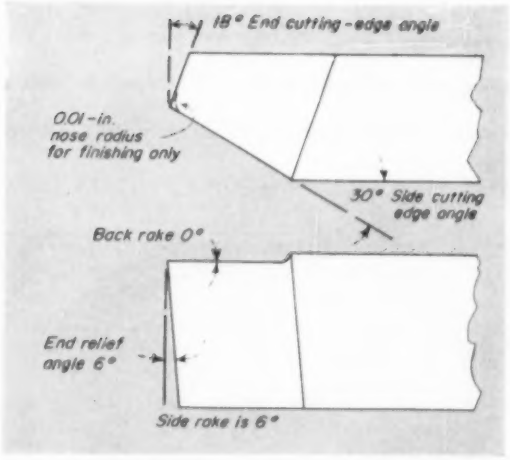
On cuts that could be done with either a shaper or miller, HSS tools should be applied to the shaper. They last longer and are easier to regrind. Shaping should be done with a generous positive rake.

Where milling with HSS is necessary, it should be slower than with steel, and done with a cutting oil, kerosene, or carbon tetrachloride as coolant.

Excellent results have been reported for carbide-tipped milling cutters. Conventional end and face mills, as designed for cast iron, can be used—with coolant. Speeds of 110-130 sfpm are good for roughing, up to a depth of cut of 0.05 in. Finishing is done at 350-400 sfpm with a 0.003-in. cut.

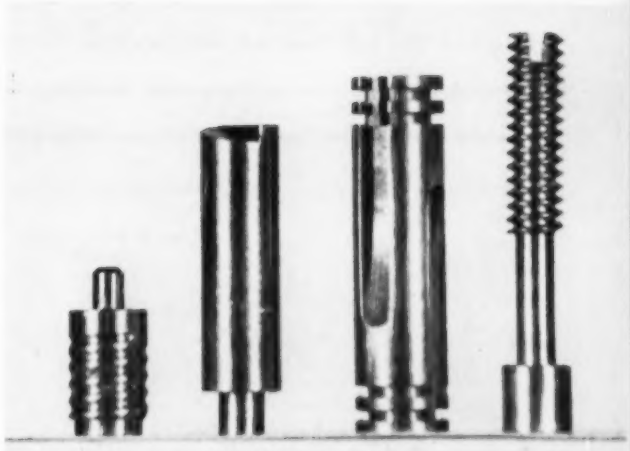
CUTTING HOLES

Generally, drilling can be done at 25 sfpm with HSS tools and sulfur-base or highly chlorinated oils; best feed is around 0.005 ipr. Reaming and tapping are done at 20 sfpm, with reaming feed at about 0.007 ipr. Molybdenum has a lower heat-expansion rate than steel, and if the tool heats very much, it will have a marked tendency to bind in the hole. Frequent regrinding is therefore necessary


18° End cutting-edge angle
0.01-in. nose radius for finishing only
30° Side cutting edge angle
Back rake 0°
End relief angle 6°
Side rake is 6°

BEST TOOL SHAPE . . .

. . . for finishing and semi-finishing has large side cutting-edge angle and generous end cutting-edge angle. When depth of cut is reduced from 0.01 to 0.01 in., finish improves



UNALLOYED ARC-CAST MOLYBDENUM . . .

. . . has been machined to produce parts for megatrons, shown 4X. Machining differences between unalloyed and alloyed molybdenum are quite slight

to keep the tool in condition to cut itself free. Drill-point angle has no noticeable effect on drill life. For deep-hole drilling, a relieved drill, upside-down drilling, or coolant at 200 psi (or thereabouts) is necessary. Apply one of these precautions when the hole depth is more than three times the dia. For good size and finish, holes should be bored.

Solid carbide drills have been applied to holes up to a ⅜-in. dia, and carbide-tipped drills have worked in larger holes. The tipped drills were straight-flute, two-lip types.

Reaming is difficult. Flute spiral seems to have no effect on tool life, which is much worse than for reaming in low-alloy steel. Cutting edges dull quickly and allow binding.

But tapping and threading are easy. A 75% thread can be tapped satisfactorily, and roll threading can be done if work and tool are both heated to about 325F. Threadcutting can also be done in a lathe, with HSS tools. Best practice is to use a sharp tool with slight side rake and some back rake; speed of 15-20 sfpm worked on ¾-in.—12 threads. Die threading is not presently recommended.

SPECIAL PROCESSES

Exploratory tests have indicated that a number of the ultrasonic, spark-discharge, and other electrolytic processes can be applied to molybdenum. A Uhlir, Jr, of Bell Telephone Laboratories, has reported on a technique of micromachining with "virtual electrodes." Holes 7 to 1000 microns in dia have been made in molybdenum with this process using a 10% potassium-hydroxide electrolyte.

Electrolytic polishing works in the laboratory, and it is also applied for cleaning up surfaces before welding. Faying surfaces can thus be properly prepared so the welds will be ductile. The electrolyte contains 150 ml methyl alcohol (95%), 50 ml concentrated hydrochloric acid, and 20 ml concentrated sulfuric acid.

FINISHING TECHNIQUES

Molybdenum is difficult to grind. This is evident from the fact that a molybdenum dressing tool is used on some diamond wheels. According to tests, it doesn't crack under heavy grinding passes, but it will sometimes when you grind only 0.0002-0.0005 in. deep. If so, a slight change in speed and feed will eliminate the trouble.

For any grinding, ample coolant is required; a 60:1 mix of emulsified oil will do. Standard grinding recommendations (see table) are actually only a starting point. If trouble is encountered, speeds and feeds should be changed accordingly. For buffing, standard practice works well. The material buffs to a lasting highly polished surface.

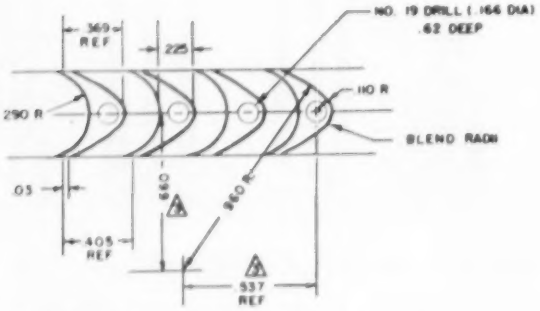
GRINDING RECOMMENDATIONS FOR ARC-CAST MOLYBDENUM

SURFACE GRINDING:		
Wheel speed	6000 sfpm	
Table speed	50 fpm	
Crossfeed	1/32 in./stroke	
Infeed dry	0.002 in.	
Infeed wet	0.005 in.	
Wheels	Carborundum AA60-K8-V40 or GA60-K6-V10	
	Norton 32A60-G15VBEP (dry), 19A46-J5VG (wet)	
CYLINDRICAL GRINDING:		
Wheel speed	6500 sfpm	
Work speed	100 sfpm	
Traverse rate	1/3 wheel width/rev, 0.001-in. infeed for 30-mu-in. rms finish	
	1/6 wheel width/rev, 0.0005-in. infeed for 12-mu-in. rms finish	
Wheels	Carborundum DA465-L6-V11	
	Norton 19A60-L5VG	
CUTOFF GRINDING WHEELS:	Carborundum A601-R-RR	
	Norton A601-N6R-50 with F sides	
BENCH GRINDING WHEELS:	Carborundum A36-M6V30	
	Norton A36-N5VBE	

2.. HOW TO MACHINE A MOLYBDENUM TURBINE WHEEL (A)

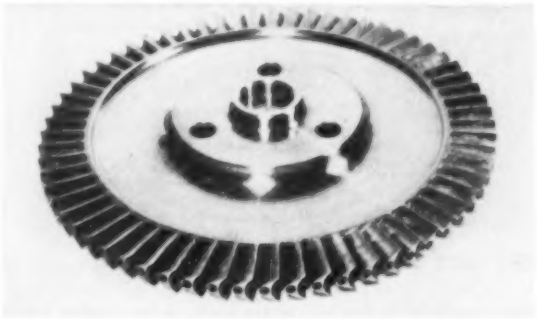
"It looked like a difficult job when we first saw it. But after putting in considerable time to get the proper tools and setup, our experience showed that we could machine intricate parts of arc-cast molybdenum without much trouble."

HARRY WOLFF, president; HARRY WOLFF CO, AUBURNDALE, MASS



SOLID-MOLY TURBINE WHEEL . . .

. . . has 63 blades, each drilled for lightness. Counterbore doesn't go through. After machining, it was deburred and polished



The turbine wheel came to us as a rough-machined forging of unalloyed molybdenum. It had a 9-in. dia, 2-in. width, and weighed 47 lb.

First step was to decide on tools, speeds, and feeds. This took some time, but we ended up with carbide tools (Carboloy grade 999) for all cutting operations. Trichlorethylene mixed with a little wax-base oil for lubricating properties was the coolant. For roughing, we cut at 470 rpm, with 0.003-ipr feed, and 0.030-0.040-in. depth of cut. For finishing, we used 585 rpm, 0.0015 ipr, and 0.010 in.

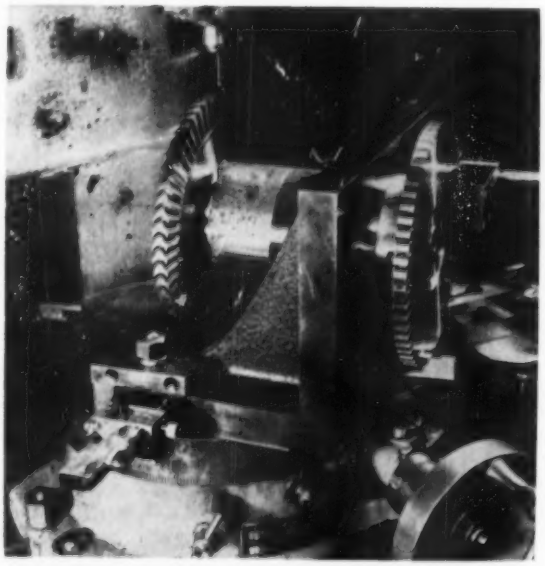
Turning was done on a 10-in lathe, where we also cut a cast-iron faceplate to match the work. This allowed reversing the wheel and mounting it for cuts on the back side.

First we turned hubs on one side—a 4¼-in. dia 9/16 in. back from the face, and a 1½-in. dia 0.310-in. back from the face. The OD was turned down to 8.920 in., and the flange was thinned to 0.7000 in. A 1-in. counterbore was machined on one face; then three holes were drilled and bored to 15/32 in. on a specified bolt circle.

The work was reversed, and the hubs and face machined on the back side.

MILLING WAS TRICKY

The toughest part was cutting a steel cam to turbine-blade shape from a brass plate, on which the contour had been laid out (oversize) and generated. A rotary table was placed on the table of a vertical milling machine; then the steel plate was mounted, with the brass plate bolted on top. A ⅛-in. cutter contoured the steel cam plate as the miller table and rotary table were moved. The cam follower was a 0.0001-in. dial indicator whose finger was the same dia as the cutter.



SLOT-MILLING SETUP . . .

. . . was on angle plate on rotary table. To left and below wheel can be seen end of steel cam, with stop. Total arc of cam was about 240°. At right is 63-tooth index plate

After the cam was finished, an angle plate with a special 63-slot indexing plate attached was mounted over the cam, and the work was suspended from the spindle attached to the angle plate. Micrometer stops were installed to help line up the angle plate accurately.

Milling was done by following the cam, which swung the tables to move the turbine wheel as required. After milling, the wheel was drilled.

The rough turbine was produced by Climax Molybdenum Co; the finished wheel was delivered to Experiment Incorporated.

3.. HOW TO MACHINE A MOLYBDENUM TURBINE WHEEL (B)

The same workpiece was handled differently by another fabricator because a special machine was available to make curved cuts. But, again, no special problems were met because the material was molybdenum

STEVE HERZINA, VADE MAHAR, WALTER KIDLE: DOUGLAS TOOL CO, DETROIT

The most important problem connected with machining the arc-cast forging was cutting the turbine blades. Luckily, there was available a Milwaukee rotary-head tool and die machine, which would make the curved cuts. Therefore, we planned a sandwich construction, with steel plates on the outside and the molybdenum wheel inside. Each curved cut taken to contour a blade would start and finish in a hole drilled radially into one of the steel plates.

First, the molybdenum wheel was turned, rough and finish, on a lathe to produce the side contours. Two steel plates, flat on the sides which would be outside on the sandwich, were contour-turned to match the wheel. Then a setup was made on a jig borer so the hub, counterbore, and three bolt holes in the molybdenum wheel could be machined. At the same setup, three matching holes in each steel plate were cut. Tolerance for machining was 0.0005 in., and all holes were lapped.

To finish up the sides of the turbine wheel, a steel plate was bolted to each side of the wheel in succession, so it could be held to the magnetic chuck of an Arter rotary surface grinder. The sides of the wheel were ground to final shape, conforming to the width of blade. When both sides were done, both steel plates were assembled, and were left on.

PLATES FOR INDEXING

One steel plate was drilled to provide 63 indexing holes, equally spaced around a circle fairly close to the plate edge. Then the assembly was mounted on an angle plate fitted with a hub and positioning pin to fit the index holes. Angle plate and assembly were mounted on the tool and die machine so lightening holes, one in the center of each blade, could be drilled.

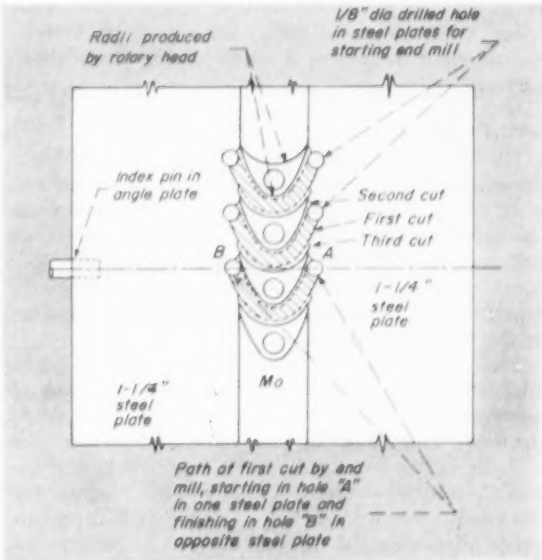
When these ⅛-in. holes were finished, they were filled with Cerrosafe to provide some extra rigidity as the slots between blades were progressively machined out. In addition, the slots were filled with the same material when completed.

Four adjacent blade projections were laid out on the OD of the molybdenum wheel to facilitate setup and machining. In each steel plate, opposite the space to be machined out as a slot between two blades, a hole with ⅛-in. dia and 1 in. deep was drilled as a starting point for the milling cutter.

Slotting was done with HSS cutters, ⅛-in. dia, and with no coolant. Speed was 630 rpm, and feed was 0.001 ipr. Eight roughing cuts ⅛ in. deep were taken through each slot until total depth of 1 in. was reached. Then finishing cuts for the facing surfaces of two adjacent blades were made with the full 1-in. depth of the cutter.

After machining, the plate was heated in hot water to melt out the Cerrosafe, and delivery was made to Experiment Incorporated, Richmond, Va.

COMPLETED TURBINE WHEEL OF MOLYBDENUM . . .
. . . has lightening holes, side contours, and slots between blades finish-machined. Actually, finished wheel was left with steel plates assembled to sides for protection during shipping. Plastic coating was also added to keep out dirt


Radii produced by rotary head
1/8" dia drilled hole in steel plates for starting end mill
Index pin in angle plate
Second cut
First cut
Third cut
B
A
1-1/4" steel plate
1-1/4" steel plate
Mo
Path of first cut by end mill, starting in hole "A" in one steel plate and finishing in hole "B" in opposite steel plate

BLADE SLOTS STARTED FROM DRILLED HOLES . . .
. . . in steel plates, at left and right sides. After eight roughing passes through middle of each slot, full depth of milling cutter was used to generate accurate front and rear contours on blades, using rotary head of tool and die machine to hold required radii

4.. SHARP CUTTERS MACHINE MOLYBDENUM TURBINE BUCKETS FAST

Moral for molybdenum: Don't be afraid of it. Experience with non-integral buckets for a turbine wheel showed only minor difficulties; no more than would have been found with any other material—only slightly different

S B BESSE, engineer, TECHNICAL SERVICE CORP, WARWICK, VA

These two turbine-bucket blades posed plenty of machining problems, but the least of them were because the material was molybdenum. If the shop hadn't been familiar with bucket-machining methods in general, any difficulties caused by the molybdenum itself would have paled in significance compared to the mechanical troubles involved.

The outside surfaces weren't too difficult. A contouring machine used for other turbine blades was set up with a six-times templet made to the airfoil shape. Cutters were HSS—the same kind used for machining steel and other ordinary blade materials. At slow cutter speed and normal feed, buckets could be cut wet or dry; though sulfurized oil as a coolant made cutter life about 20% longer.

Milling the platform, root ball, and shank was done dry without trouble. The main precautions seemed to be plenty of time, a sharp cutter, slow speed, and a depth of cut at least 0.005 in. Molybdenum can't be forced; it tends to chip off on sharp corners.

SPECIAL CUTTERS

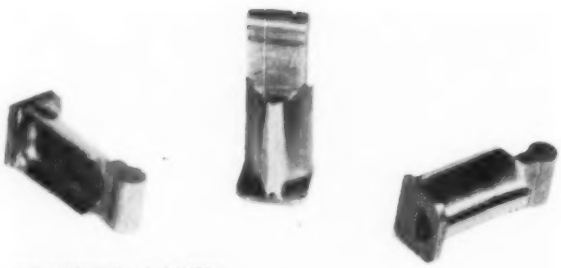
Machining the concave portion of the airfoil was done on the platform-design bucket with an end mill, but a special cutter had to be made for the shrouded bucket. This cutter had a 5/32-in. shank and a cutting OD of at least ½ in., which made it weak. It was HSS, and designed by Brown & Sharpe especially for the job, including special clearance angles for molybdenum.

The curved hole in each bucket happened to be such that practically all of the material could be removed by drilling one 3/16-in. hole, two 1/16-in. holes, and removing the material between with a ⅛-in. cutter (end mill). The larger hole and the end-milling went along without much trouble, but the small holes were difficult. Beyond 0.5-in. depth, drills kept breaking off and they were hard to get out. In spite of running them dry or wet, in HSS or carbide, drill life was only about two holes.

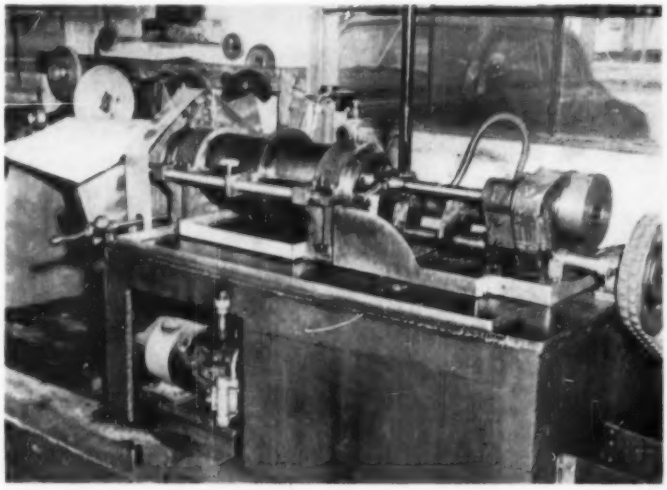
There was some slight trouble because of molybdenum's brittleness; some of the worst cracks developed during the coldest winter mornings when shop temperatures dropped to below 50 F. Otherwise, machining went along all right as long as the cutters were sharp and where the holes weren't too deep.

The customer, Experiment Incorporated, Richmond, Virginia, was happy with our results.

PLATFORM BUCKETS . . .
. . . have ball root, shank, a ½-in.-sq platform, topped by bucket proper; about 1 in. long. Airfoil shape is cored out, leaving wall thickness of 0.030 in.



SHROUDED BUCKETS . . .
. . . have rectangular section on outer end; airfoil shape fairs into root shank to fit turbine slot snugly. Both bucket types were machined from ⅝-in. molybdenum bar



CONTOUR CUTTING MACHINE . . .
. . . used for blades with airfoil section. Templet is six times full size

5.. NOW . . A BORING BAR THAT WON'T CHATTER

Molybdenum formed by a new process makes boring bars and tool shanks of any size, and it easily outperforms steel for rigidity and resistance to vibration

ROBERT W. LESMAN, vice-president and general manager; NOBLES ENGINEERING & MFG. CO.

You can't always get the rigidity you need for boring, grinding, and internal milling simply because you can't make the toolholder massive enough. Carbide is one answer, but it's brittle; and it can't always be obtained in sizes large enough for a toolholder.

There seemed to be another possibility in the new arc-casting and rolling process developed by Climax Molybdenum, which produces pure moly with a modulus of elasticity of 46 million psi—1.58 times that of heat-treated alloy steel and with a specific gravity of 10.1, or 1.3 times that of steel. Other properties compare roughly with steel, so the material looked as though it should outperform heat-treated alloy steel where dimensionsal stability under load and freedom from vibration were important factors.

FIRST TEST

To prove this, we made two identical boring bars, 10 in. long, with a 1-in. dia; one of heat-treated 5132 steel, and the other of the new moly. Two identical toolbits were made, and two identical workpieces were prepared. These were bushings with an OD of 3.0 in., ID of 1.500 in., and length of 4.0 in. They were heat-treated to R_c 30-32.

We wanted to check surface finish and taper developed in a straight cut, so we chucked them in a 16-in. engine lathe and ran it at 200 sfpm, with 0.01-ipr feed and 0.100-in. depth of cut. Here are the results:

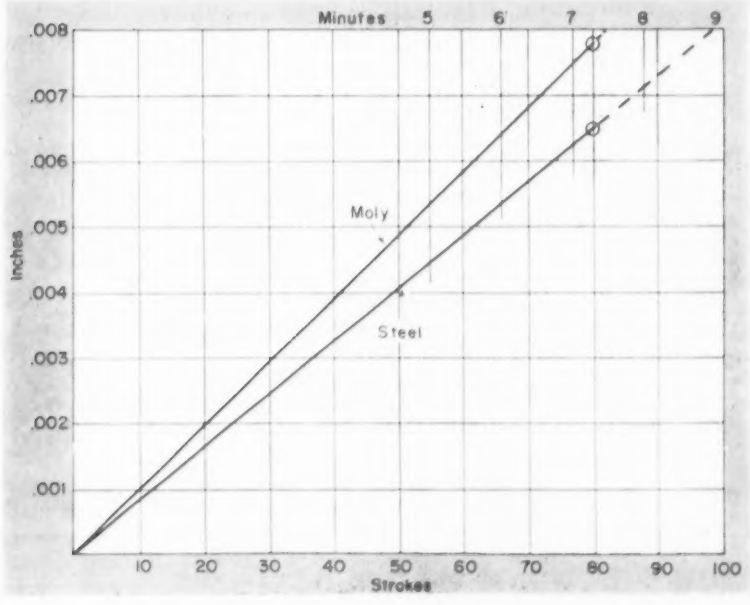
Boring Bar	Taper	RMS Finish
Steel	0.0095 in.	275-350
Moly	0.0002 in.	70-85
Difference:	0.0093 in.	

This proved the molybdenum bar had exceptional rigidity; also that it dampened vibration much better.

ECCENTRIC TEST

Next, we chucked similar bushings 0.060 in. eccentric to the spindle, and ran the tests at the same speeds and feeds (depth of cut varied between 0.100 in. and 0.040 in., depending on which side of the hole was being cut):

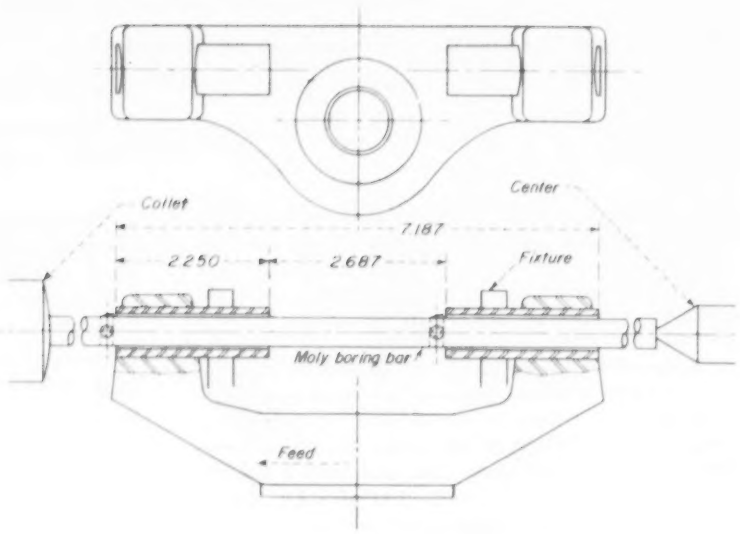
Boring Bar	Front Eccentricity	Rear Eccentricity
Steel	0.0011 in.	0.0020 in.
Molybdenum	0.0003 in.	0.0005 in.
Differences:	0.0008 in.	0.0015 in.



TEST GRINDINGS ON SAME MACHINE . . .

. . . with original steel quill vs identical quill made of molybdenum, showed that molybdenum resulted in higher productivity. Better stock removal by moly quill was quite uniform all along

5.. NOW . . A BORING BAR THAT WON'T CHATTER



PRODUCTION BUSHINGS . . .

. . . are machined out with molybdenum boring bar and two 0.187-in. round carbide bits with no scrap whatever, as long as reasonable care is taken to maintain bits in good shape. High density of the bar is main reason for good performance

This proved the hole bored with the steel bar was only a quarter as round as the hole bored with the molybdenum bar.

INTERNAL-GRINDER QUILL

We continued cursory testing by making a grinding quill identical in size and shape to the quill on a Rivett internal grinder, only made of arc-cast and rolled molybdenum. Test parts were alloy-steel collars with 0.600-in. ID and 2.25-in. length; hardened to R_c 48-53. The wheel was a 57A46K5YBE, and ran at 11,000 rpm. The work rotated at 1000 rpm, and table feed was 11 strokes per min. Table feed was 0.002 in. per 10 strokes.

After 80 strokes with each quill, we compared these results:

Quill	Dia Enlarged
Molybdenum	0.0078 in.
Steel	0.0065 in.
Difference:	0.0013 in.

Measurements taken at the end of each ten strokes showed the difference in stock removal progressed uniformly. To remove the same amount of stock (0.0078 in.), the steel quill would have to take 20 strokes more than the molybdenum quill, or work 1.82 min longer.

In addition, the molybdenum quill promoted less wheel wear, cooler grinding with less distortion, and greater accuracy.

PRODUCTION ADVANTAGES

A production part illustrates some advantages of molybdenum as a boring-bar material. The piece is a U-shaped yoke with two bushings, one in each arm, heat-treated to R_c 36-41. The bushings are about 2.625 in. long and spaces approximately 2.687 in. apart. They are located with only reasonable accuracy—within 0.005 in. total indicated runout—in line with each other, and drilled 0.500 in. to an accuracy of 0.010 in. tir with the OD.

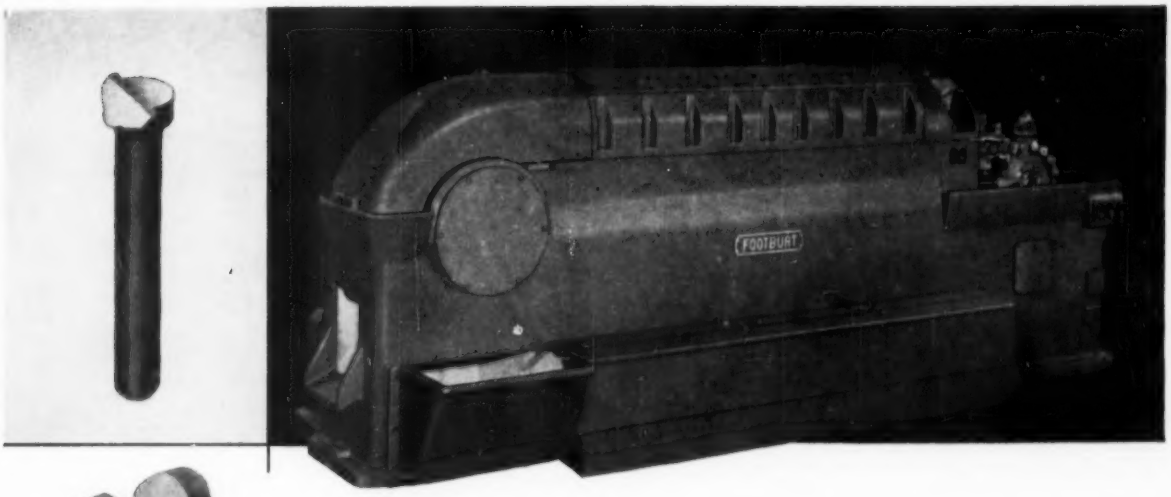
Both bushings are bored with round carbide tools held in an 11-in., 0.437-in.-dia molybdenum boring bar. Finished hole size must be 0.5625 in. ±0.0005 in., and the holes are checked by a 0.5604-in. alignment bar that must pass freely through both holes at once.

The boring cut trims the holes to 0.546 ±0.006 in., and a final pass is made with a carbide-tipped floating reamer. Scrap due to misalignment, which can be as high as 0.0125 in. before the boring cut, has been eliminated as long as reasonable care is taken to keep tools sharp. The molybdenum boring bar eliminated an intermediate boring cut, saving 21¢ per piece in direct labor.

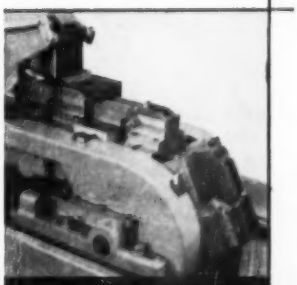
As material for a boring bar, molybdenum can do these things:

- Eliminate intermediate operations
- Improve tool life
- Eliminate most size limitations
- Allow shock loads
- Simplify toolholder machining
- Allow more use of carbide tools
- Allow increased speeds and feeds

It also seems logical to use the material to advantage in machine-tool spindles, quills, bearing housings, cutter bodies, and arbors. In general, it should provide new answers to problems involving rigidity and surface finish.



lower cost *per piece with* surface broaching *of small parts*



■ Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching, in many fields.

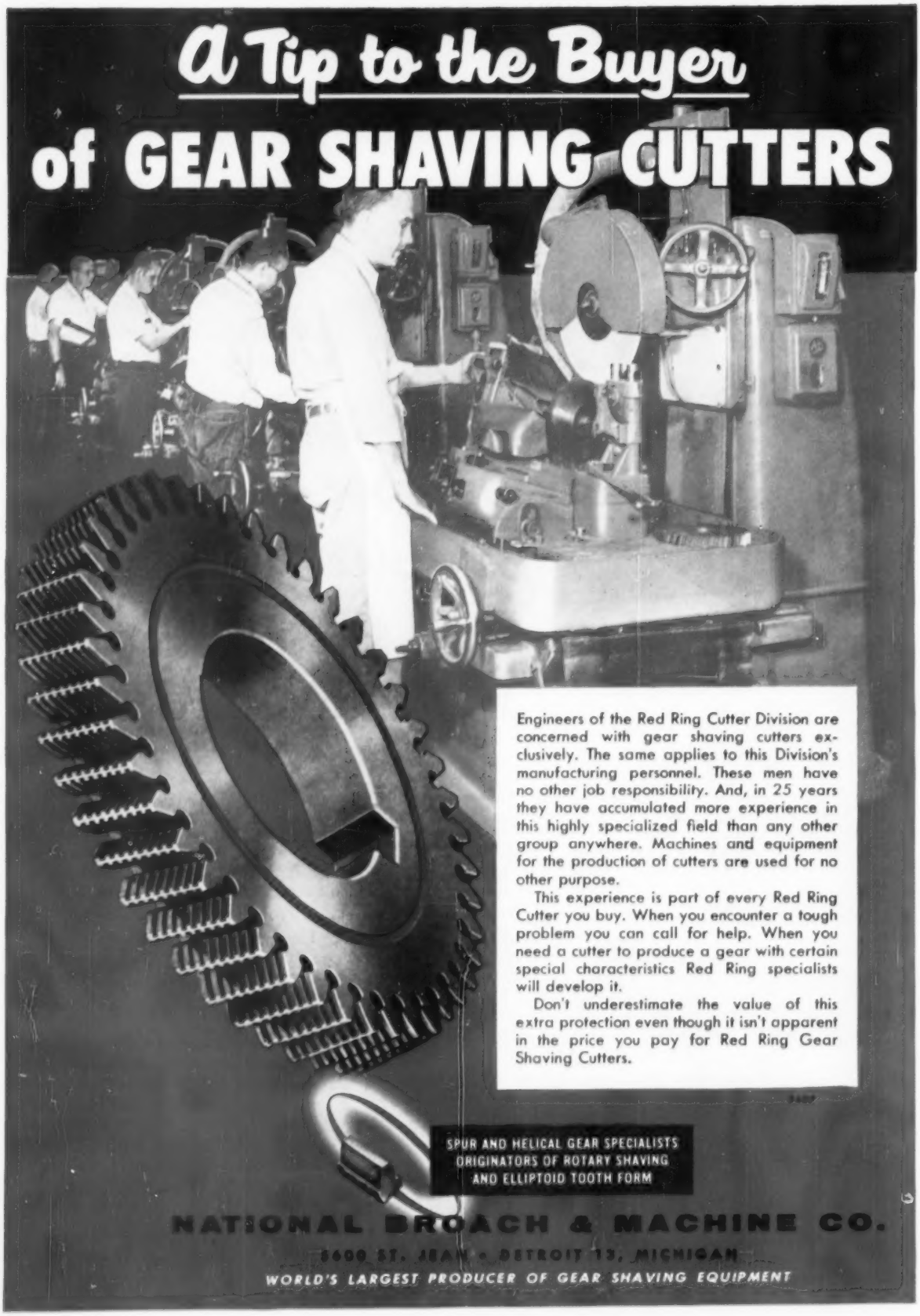
THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

Engineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

A Tip to the Buyer of GEAR SHAVING CUTTERS



Engineers of the Red Ring Cutter Division are concerned with gear shaving cutters exclusively. The same applies to this Division's manufacturing personnel. These men have no other job responsibility. And, in 25 years they have accumulated more experience in this highly specialized field than any other group anywhere. Machines and equipment for the production of cutters are used for no other purpose.

This experience is part of every Red Ring Cutter you buy. When you encounter a tough problem you can call for help. When you need a cutter to produce a gear with certain special characteristics Red Ring specialists will develop it.

Don't underestimate the value of this extra protection even though it isn't apparent in the price you pay for Red Ring Gear Shaving Cutters.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

MACHINE-REPLACEMENT CHART..1

Published by courtesy of the American Society of Mechanical Engineers, 29 W 39th St, New York 18. Complete copies of Mr. Ottesen's paper (No. 56-SA-2) are available from the ASME; 50¢ to non members, 25¢ to members.

REALF W OTTESEN, senior designer, McCULLOCH MOTORS CORP, LOS ANGELES

Hourly cost of using a machine tool involves the cost of the machine per hour plus wages. To determine the total hourly cost, you must consider 10 factors, as given in the table "Nomogram Data," and the total hourly cost found by use of the nomogram on page 163, or solved from the equations given.

Let us analyze these ten factors in the table with respect to an example—a cylinder borer costing $25,000

Initial cost—*A*

Machine cost	20,000
Freight & erection @ 5%	1,000
Additional tools	4,045
A =	25,045

Depreciation factor—*a*:

Depreciation period, 14 yr	0.0715
Repairs, 2%	0.02
Interest, 4.5% (taken for 2/3 of period	0.03
a =	0.1215

Depreciation factors are matters of personal judgment but must be acceptable to the Bureau of Internal Revenue. Consideration must be given to price fluctuations, so that capital is available to purchase a replacement. Repairs ordinarily cost little when the machine is new but increase with its age. For machine replacement studies, the figures should be calculated once and followed as long as the tool is being used.

Interest charges should be applied regardless of whether the machine is purchased with borrowed money or the firm's capital. However, we must take into account the accumulation of depreciation funds, and not charge interest of say 4.5% over the life of the machine. These funds are usually re-invested in the business and we shouldn't charge interest "twice" against the machine. To settle the matter we will charge interest at two-thirds rate for the life of the machine, or $2/3 \times 4.5 = 3\%$.

NOMOGRAM DATA

Item		Units	Example: Cylinder Borer
Initial cost	*A*	$ -	$25,000
Depreciation factor	*a*	% -	0.1215
Space requirement	*q*	ft² -	100
Specific cost of floorspace	*b*	$/ft² -	$1.25
Cost of power	*s*	$/kwhr -	$0.025
Power consumption	*p*	kw/hr -	1.8
Utilization factor	*X*	hr/year -	2000
Direct hourly wages	t_i	$/hr -	$2.20
Indirect hourly wage factor	*K*		0.22
Unproductive wage factor	*z*		0.10
Total debit cost per hour	*D*	$/hr -	$4.55

$$D = \frac{a\,A + bq + X\,[t_i\,(1 + z + K) + ps]}{X}$$

$$X = \frac{a\,A + qb}{D - t_i\,(1 + z + K) - ps}$$

Space requirements—q

Floorspace requirements consist of:

Space for machine	35 sq ft
Work in process	30
Space for worker and his toolchest	20
Proportionate part of all indirect space	15
q =	100 sq ft

Cost of floorspace—b

Current expenses are assigned to the machine according to floorspace. The figures will vary with the plant, but here is a summary for our example:

Total rent of space	17 q
Heating	8 q
Ventilation	2 q
General lighting	4 q
Machine lighting	4 q
Insurance on machine	1 q
Other charges	4 q
b =	40 q ($/yr)

Rent and maintenance are far less expensive than depreciation, and an error will not greatly affect the final hourly cost. However, if you are figuring the profit position for a great number of machines, not just one, it is unwise to disregard even minor expenses.

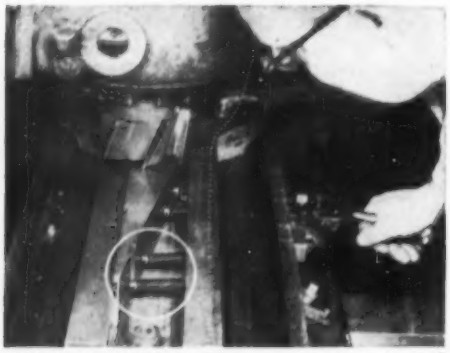
Direct Hourly Wages—T

Assumed hourly wage t_i	= $2.20
Number of hr per yr	= 2000
T=$/yr per worker	= 2000 t_i

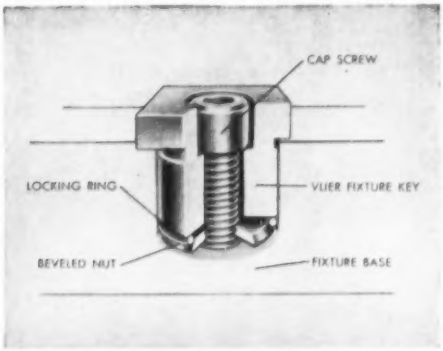
Total annual wages for all produc-

What can be done to lower YOUR tooling costs?

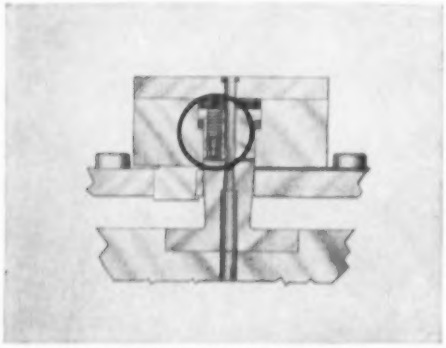
Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.



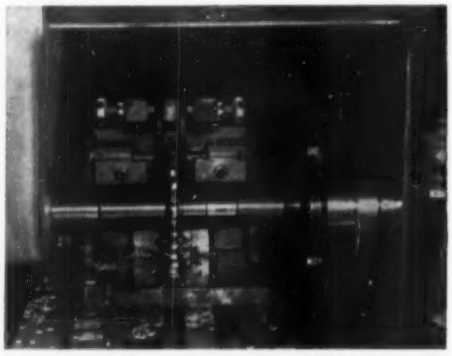
CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.



NEW FIXTURE KEY WITH INSTANT-ACTING, INTEGRAL LOCK eliminates unnecessary drilling and tapping operations to mount keys in fixture base. Holds key securely, permits quick change of key size for different table slots. Insures perfect alignment of jigs and fixtures on table.



NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.



THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.

Where can your tool room save?

Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties—applications where expensive, complicated, home-made devices are now being used. *Why not write for your copy of the new 1956 Vlier catalog today?*

Originators of small parts that make a big difference in tooling costs!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

MACHINE-REPLACEMENT CHART..II

tive workers can be expressed as L_2.

Indirect Hourly Wages—L_1

Wages for office employees per yr can be expressed as L_1 ($/yr)

Indirect Hourly Wage Factor—K

Assumed value of K=0.21, where $K=L_1/L_2$

Indirect expenses take many forms: cost of shop supervision; office salaries; fringe benefits; vacation pay; telephone, light, heat, postage, supplies, cleaning, etc, in the office areas.

Factor K will vary somewhat, depending on the complexity of the business, but in 90% of cases it will be between 0.18 and 0.25. Here $K=L_1/L_2$, where L_1 equals the sum of all indirect wages for salaried employees for a 2000-hr yr, and L_2 equals the sum of all direct wages for a 2000-hr yr. In this case K is assumed as 0.21. Similar assumptions cannot be made for a plant doing highly experimental work or one that prices on a cost-plus basis.

The indirect wage factor K can also be determined from these equations:

$$K = \frac{\frac{L_1+L_2}{T_1}-t_1}{t_1}$$

where T_1=2000 m, and m=number of productive workers

We can express indirect hourly wages as $t_2=Kt_1$

Then $t_1=\frac{L_1+L_2}{T_1}-t_1$

The portion of direct hourly wages that corresponds to vacation pay,

$$t_1=\frac{100\ mt_1}{T_1}$$

If T_1=2000 m, t_1=100 $mt_1/2000\ m$ =0.05 t_1

The unproductive wage factory consisting of fringe benefits, postage, telephone, cleaning and building repair may be expressed as this portion of wages, $t_4=y\ t_1$. In this example, y is assumed to be 0.05.

Total hourly wages can now be written:

$t_{total}=t_1+t_2+t_3+t_4$

Unproductive Wage Factor—z

Items t_3 and t_4 can be added to give z, the combined unproductive wage factor.

Then $t_{total}=t_1\ (1+z+K)$

The total debit cost per hour is reduced by t_{total} and cost of power. The power cost can be estimated, or determined from time studies, or averaged by connecting a wattmeter to the circuit.

The profit V a tool makes in $/hr can be expressed as $V=D-t_{total}-ps$.

How to Use Nomogram, p 163.

The equations for D and X are not practical for ordinary estimating and shop use. The chart, p163 is designed so that the numerator of the equation for X remains on the upper part, and the calculation of the denominator is performed on the lower part.

To Find D

From $25,000 initial cost of machine on scale A, project to scale B to multiply by the depreciation rate a of 0.1215 and mark this point.

From 100 sq ft (value q on scale F), project to scale E to multiply by cost of floorspace b.

Connect the marked points on scales B and E. The intersection on scale C is projected through the proper utilization factor (X=2000) to scale D (approximately 1.60).

The distance from the intersection on D to the origin O is transferred to scale L by swinging an arc from O, to give the reciprocal of the value intersected on scale D.

From the proper value of K (0.22) on scale G, a line is projected through the proper z scale point (0.10) in the group of curves for direct hourly wages t_1 until scale H is cut. This point solves $t_{total}=(t_1\ (1+z+K)$.

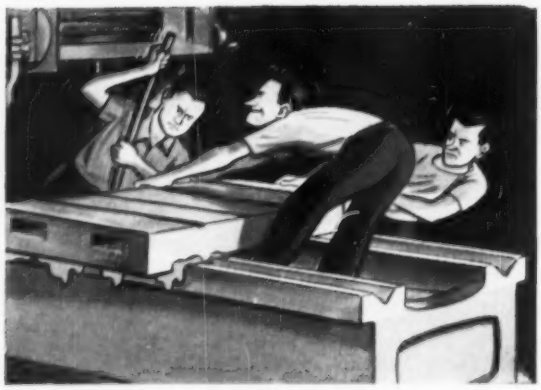
Power cost p on scale N is projected to scale M to multiply by the cost of power s.

Now connect the points on scales H and M. This step adds these values on scale I.

Finally, a line is projected from scale I to scale L at the point transferred from scale D by swinging the arc. Scale K is cut at D, the total hourly cost of the machine tool per hour. The value so found is $4.55 per hr.

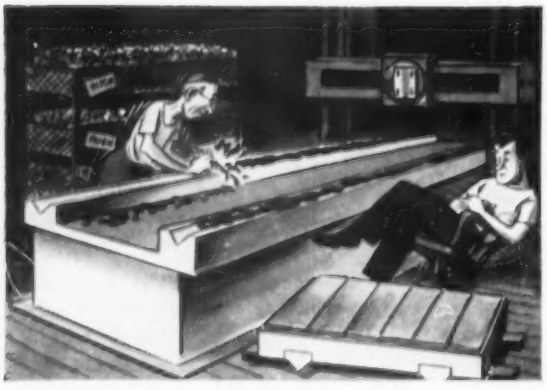
This nomogram is usable for a variety of calculations. If one variable is unknown, the calculation can be started at any point, until an axis is reached that gives desired value.

1. Cures "stick-slip" or "jumpy table". When a table gets the "shakes", especially after it has just reversed or when the load is heavy and the speed slow, it's probably suffering from "stick-slip". Remedy—Sunoco Way Lubricant®. Special polar compounds in Sunoco Way Lubricant form a friction-reducing film that keeps a table sliding smoothly under all operating conditions.



2. Doesn't squeeze out. When you use a heavy oil as a way lubricant, you must use a lot of oil to maintain a thick enough film. But, heavy oil squeezes out if the table sits in one position very long. You have a tough time getting the table moving again. Protected by the tenacious thin film formed by Sunoco Way Lubricant, the machine can be idle for a week and it will start easily.

WHY SUNOCO WAY LUBRICANT CAN HELP CURE YOUR MACHINING PROBLEMS



3. Protects expensive ways. Badly scored or pitted ways, caused by inadequate way lubrication, result in lost production and expensive repairs. The high film strength of Sunoco Way Lubricant eliminates the danger of metal-to-metal contact, the chief cause of scoring and way wear. Excellent metal-wetting and non-corrosive properties eliminate rusting and pitting.

For the lubrication of slides and ways on this machine, we recommend the use of
SUNOCO WAY LUBRICANT
a product of
SUN OIL COMPANY

4. Approved by more than 55 machine-tool builders. Every major machine-tool builder has tested Sunoco Way Lubricant. It is always approved. In fact, to assure maximum efficiency of their product, many manufacturers ship a supply of Sunoco Way Lubricant with each machine. We'll be glad to send you the list of manufacturers who have approved Sunoco Way Lubricant.

For more information, see your Sun Representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-9

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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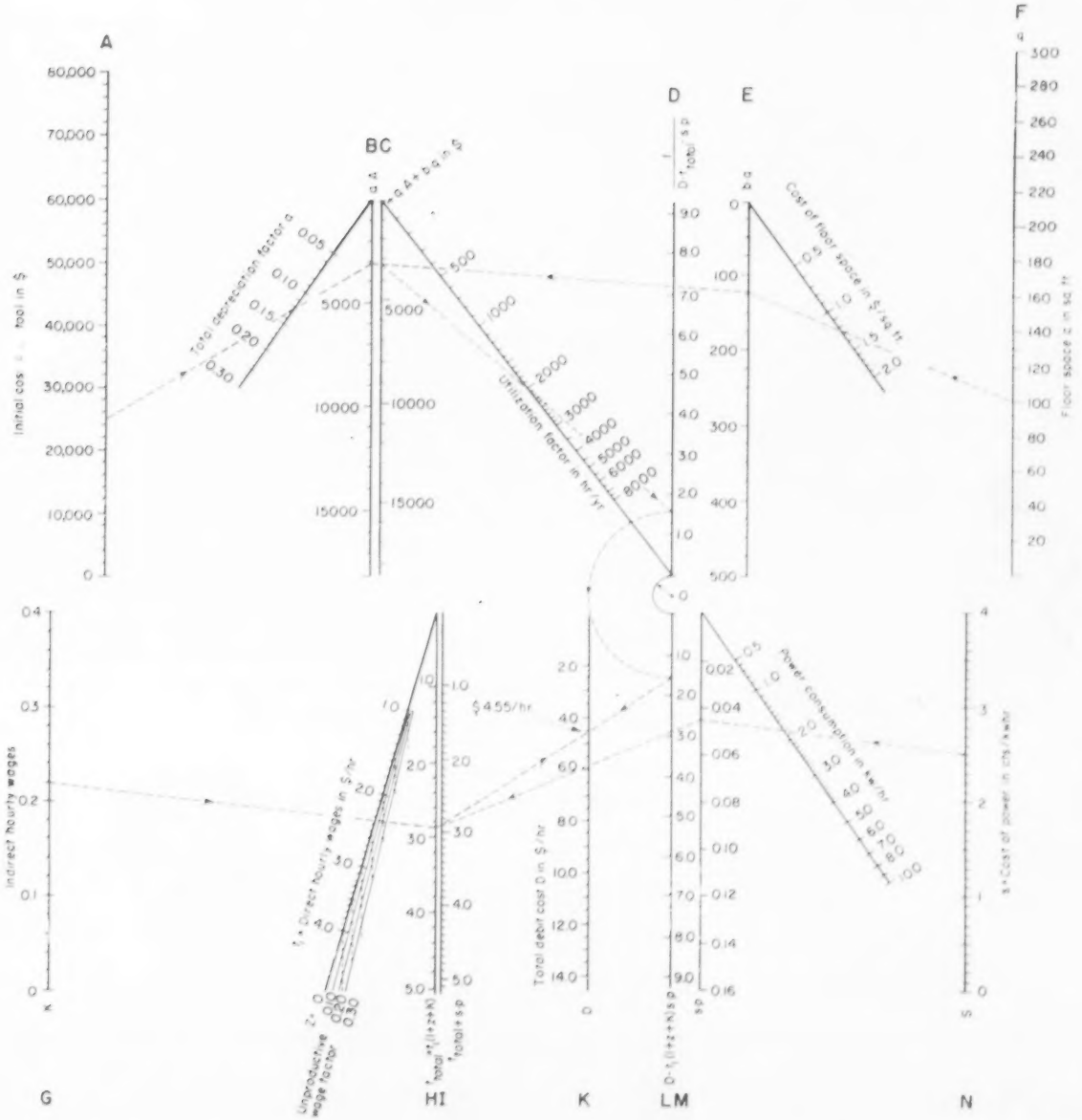
MACHINE-REPLACEMENT CHART..III

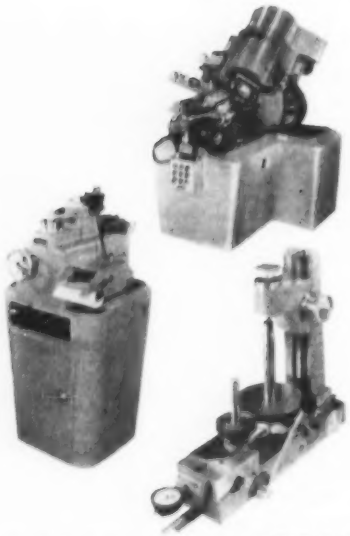


This man knows

gear production!

He knows gearing, gear generating tools, gear finishing and gear quality control, based on ILLINOIS TOOL WORKS' 44 years of experience.

Selecting complex gear production equipment requires a thorough knowledge of gears and a complete understanding of economical cutting tool production and application. Your Illinois Tool Works Sales Engineer draws on his own years of experience and on Illinois Tool Works' engineering talents and production facilities to help plan your gear generating program. He can impartially advise you on the best and most economical tools for your specific requirements. Call him in for a discussion on your gear generating needs today.



Illinois Tool Works gear production tools, machines and inspection equipment are known throughout industry for highest standards of quality and performance.

"Faster Gear Production"

Send for this informative book that shows how better gears can be made faster . . . at lower cost! Write for it today!

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Look to your Illinois Distributor for the most complete line of standard end mills, standard milling cutters and special cutters.

Talking Shop . . .

White Collar

That a sense of humor has returned to one plant after a 156-day strike was evident recently. The plant manager passed the word to foremen that they should improve their dress so they would be distinguishable from the workmen on the production lines. The next day the workers on one line turned up with perfectly straight faces and ties around their bare necks. The day after that the men on the next line went them one better with both white shirts and ties. It was all in good fun, evidently, for productivity reached a new high that day.

Lost in the shuffle was the revealing fact that on many a production line today it has become practical for the operators to wear white shirts and ties if they want to. Time was when to wear a white shirt in a plant was to never wear that shirt again and to wear a necktie was to run the risk of never wearing anything again.

Flame Ceramics

Ceramic coatings can now be sprayed on metal and other materials by a process developed by Armour Research Foundation of the Illinois Instiute of Technology. The surface is sand or grit blasted, if metal; cleaned thoroughly, if non-metallic. The powder, usually a single oxide such as alumina or zirconia, with the necessary additives, is blown through a flame torch (sometimes oxy-acetylene, but usually oxy-hydrogen). The particles are sintered as they are fed through the flame. The surface being coated does not have to be heated nearly as much as with other methods of applying a ceramic coating. First application is expected in rocket nozzles, but it is likely to find other uses not only in heat protection for aircraft parts and engine parts, but for wear resistance. Armour has licensed the process to Continental Coatings Corp, Chicago, for commercial application.

Whither Steel?

Chances for aluminum, plastics, asbestos-cement, concrete and timber to compete with steel have been studied by an agency of the United Nations (the Economic Commission for Europe, in Geneva). Gist of the 76-page report is that in the next five years, these materials will not cut into steel markets by more than 10%. That sounds like the steel industry in Europe, or in the US, will find the competition bearable and will continue to grow by expanding its other markets. But have you noticed the ill-concealed glee with which the aluminum industry in this country is looking forward to announcement of the 1957-model cars?

Private Reactor

Westinghouse is now building a nuclear reactor for test work, said to be the largest and most versatile in private hands. It is a thermal neutron reactor generating the heat equivalent of 20,000 kilowatts. With the rate at which Metalworking has been turning to isotopes to test die and tool wear, among other things, the new Testing Reactor may get a fair share of its business from the research labs of Metalworking. If you are interested, your first step is to secure a license from the Atomic Energy Commission (Isotopes Extension Div of Civilian Application, Box E, Oak Ridge, Tenn).

Tapping Titanium

A combination of wax lubricant with wax coolant solved a tapping problem for Lowden Machine Company of Florence, New Jersey. The part is a turnbuckle for jet engines, 2½ in. long with 1.5 in. deep holes tapped ⅜"-24, Class 3 in each end. Tap life was averaging only three or four pieces when Lou Lowden decided to try the wax combination. He stuffed the hole with Johnson's No. 122 lubricant (oil soluble) and flooded the work with Johnson's TL131 (water soluble). Each has little effect on the other, and taps now average 100 pieces between grinds.

Radiation and Lubricants

YOU DON'T HAVE TO WORRY about cutting fluids and lubricants breaking down in the presence of radiation, despite what you may have heard about "queer" effects. At least that's what preliminary tests made by major oil companies and research outfits indicate. While the results are not yet conclusive, it appears that oils and cutting fluids undergo chemical and physical changes only when they are irradiated *inside* a reactor. Radioactive materials, when being machined, do not produce the intense radiation and heat required to affect cutting fluids or machine lubricants. Further investigation will be made at the laboratory being built in San Antonio as part of Pratt & Whitney's nuclear-powered-aircraft program.

Recruiting Shortcut

Lamenting the dangerous shortage of engineers, an occasional pundit will point to the overlooked chance to use the ones we have better. One area where this has been done is in the research laboratory, says James O Bengston, president of Chicago Apparatus Company. From 1950 to 1955, he points out, the average laboratory's ratio of supporting personnel to scientists increased from 0.75 to 1.09. This, he says, had about the same effect as increasing scientific manpower by 45%. While his claim for the increased output per scientist seems over-optimistic, his point is valid. Why not take time out from plotting ways to lure more engineers away from the other fellow and see what you can do to give the ones you have the support they need to do their best work.

Metal Show Will Be Biggest Ever

Ingredients: 465 Exhibits, 4 Societies, 46,000 Attendance

CLEVELAND—When the 1956 National Metal Exposition & Congress—the Metal Show—opens its doors here at the Public Auditorium, some 46,000 engineers, metallurgists and production men will see 250,000 square feet of exhibit space jampacked with the displays of 465 suppliers to the metals and metalworking industries.

Running concurrently with the Metals Show the week of October 8 through 12 will be the National Metal Congress with its presentation of more than 150 technical papers in four Cleveland hotels. Each of the hotels will headquarter one of the four participating technical societies: American Society for Metals will be at the Statler; the American Institute of Mining, Metallurgical and Petroleum Engineers will be at the Carter; American Welding Society at the Cleveland; and the Society for Non-Destructive Testing at the Hotel Hollenden. Two other societies, the Metals Division of the Special Libraries Association, and the Industrial Heating Equipment Association, will hold meetings during Metal Show week, too.

Show hours the first three days will run from noon to 10:30 pm, the last two days from 10:00 am to 6:00 pm.

ASM Program

ASM will hold a pre-Metal Show seminar at the Statler on "Creep and Recovery," with 13 technical papers slated for presentation. Highlights of the Congress include one-day conference October 11 on thorium, cosponsored by ASM and the Atomic Energy Commission, which will feature 22 talks by top nuclear experts. Also new this year will be a special ASM forum on die life and die wear, with attendance limited to 200 people on the theory that this is to be a "participation" forum, rather than a lecture one.

Also concurrent with the Show will be ASM's annual Metallographic Exhibit. Highlights of ASM's program will include:

Technical sessions on plastic deformation of aluminum and ferrous alloys; metallurgy of gray, malleable and nodular irons; mechanical and metallurgical properties of titanium; two sessions on metallurgy of steel; one on stainless steel; an all-afternoon session on uranium-molybdenum alloys and other nuclear materials; a day-long session Thursday, October 11 on high-temperature alloys and their problems.

Four sessions of ASM's Educational Lecture Course, to be held Monday and Tuesday, October 8 and 9 at the Statler Hotel, will deal with the "Effect of Residual Elements on the Properties of Metals." Two more sessions of the course will take up "Fatigue Endurance of Carburized Steel" Thursday morning and afternoon.

American Society for Metals' Annual Meeting will be held Wednesday morning, October 10, at the Statler. This will be followed immediately by ASM's Campbell Memorial Lecture, with Dr Charles S Barrett of the University of Chicago's Institute of Metals Study speaking on "Metallurgy at Low Temperatures."

The Society's Annual Banquet will be held at the Statler Hotel the evening of October 11. ASM's Albert Sauveur Achievement Award will be presented then.

AWS and AIMMPE

American Welding Society's program runs Monday through Friday, October 8-12, will have technical sessions on (Monday) structures, weldability and research, inert arc welding; (Tuesday) aircraft welding, weldability and research, design and inspection, inert-arc welding, welding of titanium, and a symposium on metallizing; (Wednesday) brazing and surfacing, filler metal, piping and pipelines, resistance welding, stainless steel, and pressure vessels; (Thursday) welding and cutting, aluminum, piping and tubing; and (Friday) molybdenum and zirconium, processes, and shop management. All sessions will be held at the Hotel Cleveland.

AIMMPE Metals Division's program will start Monday, October 8, with a research seminar on embrittlement, followed by an afternoon symposium on nuclear metallurgy. Tuesday will have a research seminar on crystalline imperfections and mechanical behavior, and a symposium on the production economics of titanium in the morning; and in the afternoon a symposium on the practical problems of interstitial control of titanium, plus a research summary on atom movements and structure. Wednesday morning will see research summaries on kinetics and thermodynamics, and on transformation. Afternoon will have a symposium on magnetism, and research summaries on alloy systems. Sessions are at the Carter Hotel.

Non-Destructive Testing

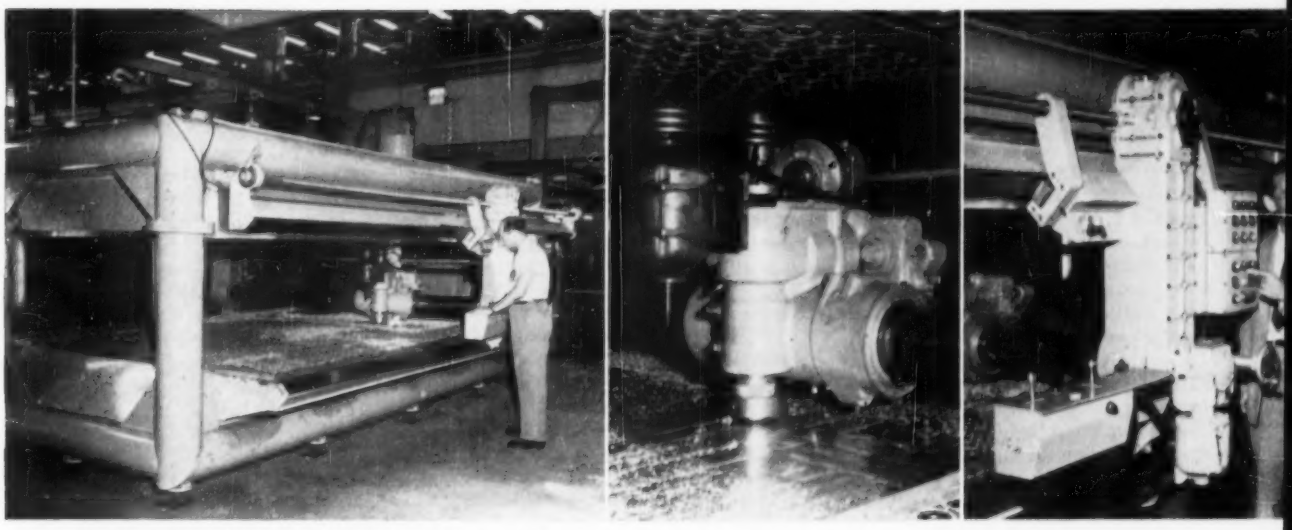
Scheduled in the Society for Non-Destructive Testing's tentative four-day program beginning Monday are educational sessions; (Tuesday) developments in non-destructive testing, and non-destructive testing in the petroleum and chemical industries; (Wednesday) non-destructive testing of nuclear reactor components, and the Mehl Honor Lecture; and (Thursday) non-destructive testing of ordnance and aircraft Sessions are at the Hollenden.

Industrial Heating Program

Industrial Heating Equipment Association will hold a one-day program, beginning at 9:30 am Thursday, October 9, on selection and application of furnace atmospheres, control of atmospheres, and maintenance and operation of atmosphere furnaces. Session is at the Statler.

Theme of the 1956 National Metal Exposition & Congress will be "spend to save," with emphasis on cost-cutting economies of new equipment as compared to obsolete machines.

More than 46,000 men from the metals field are expected to attend the Show and its attendant four-society technical programs. Members of ASM and other participating technical societies and exhibitors' guests will register under separate classifications from the general public, which will be admitted to the Show for a $1 registration fee.



Machine tool framework and joystick controls . . .

OPPOSED VACUUM CHUCKS (left) hold wing skins in place on Convair's new skin miller as spindle head (center) with auxiliary attachment goes to work. Elaborate control panel and joystick controls (shown in the photograph at right) allow operator a high degree of flexibility without loss of accuracy

Something New in Skin Millers

SAN DIEGO—A unique skin miller is being employed here at Convair in building F-102A jet interceptors. It consists of a machine-tool framework 12 ft 4 in. wide, 19 ft 4 in. long, and 7 ft 6 in. high that supports two horizontal-plane platens, one 30 in. above the other. Each 9x16-ft platen supports and attaches to octopus vacuum chucks in opposing positions.

Upper chuck supports and secures a templet that provides a milling outline contour and depth of milling cut control for the follower contact—allowing X, Y, Z axes movement. Templet is a mirror image of the workpiece: depth of milling control surface is a negative image plane.

The lower vacuum chuck supports and secures the wing skin, indexed to coincide with the templet above it. These chucks allow varying size sheets to be held.

A milling head is gantry supported in the space between the two vacuum chucks and provides a milling cutter spindle and a templet follower. Their axes are instant and allow direct templet information transposition.

The milling head assembly is a self-contained unit. It provides its own power, a 5½ hp motor. Cutter peripheral speed is 4000 to 4400 fpm. A 1/3 hp motor powers the cross feed transmission mechanism, and traversing speed is 36 ipm. Maximum depth cut is 2 in. Two air cylinders also are contained within the spindle assembly: their axes also are instant with mill cutter spindle and follower.

One air cylinder actuates the spindle to withdraw the milling cutter from the work and/or to insert the milling cutter into the work. The second air cylinder actuates the follower, either withdrawing the follower from the templet or inserting the follower into the templet. Double acting air cylinders controlling the cutter spindle and follower provide "Z" axis or varying depth duplication.

The cross feed transmission mechanism consists of a gear train that turns two diametrically opposed shaft assemblies. Each consists of a wrap spring drive, friction clutch and worm gear. Forward and back movement of the control handle actuates solenoids which release or drive either one of the wrap spring drives.

Longitudinal feed of the gantry assembly by a ¾-hp motor is obtained through the same detailed design as for the cross feed, except that two longitudinal feed transmission mechanisms are employed. This is necessary because of the length of span between the gantry side arm supports. By simultaneously driving through a torque tube on both sides of the gantry, yaw chatter or binding is avoided.

Because the cross and longitudinal feeds are driven by friction clutches, any vector combination of X and Y coordinates as predetermined by the templet can be easily followed by positively driving one direction of feed and allowing the opposite 90° phased feed to slip, or, driving the follower into and with the templet contour being followed. Depth of cut is fully automatic, or direct templet transposition.

The largest workpiece that can be handled is 2 in. thick, 96 in. (plus the diameter of the mill cutter) wide, and 180 in. (plus the diameter of the mill cutter) long.

When development of the machine was started, no skin milling machine was available to take the 8x15 feet skins of the F-102A wing, except on special order.

The machine was designed specifically for handling aluminum skins. But the machine concept is applicable to steel if the horsepower of the spindle motor is increased.

M-Day Tool-Pool Program Moves into

WASHINGTON—The Government's "M-Day Machine Tool Pool Order Program" is nearing completion. "Phantom" contracts have already gone out to 21 machine tool builders for possible future production of $68.7 million worth of equipment.

Office of Defense Mobilization and General Services Administration are negotiating with 63 other companies for emergency production of $181.3 million worth of tools. In all, 120 producers of general-purpose machine tools were given a chance to take part in the program.

How It Works

Under the Pool Order Program, the builders are given orders for large quantities of general-purpose tools which would be quickly needed in a future emergency—the government guaranteeing to pick up the tab if builders are unable to sell the tools to arms makers. Actual production and money outlays from the government, however, do not start unless all-out mobilization is officially declared. At that time, contracts would become effective, builders who could prove financial need would get working capital advances up to 30% of the value of their orders.

"Phantom" Contracts Let

Meantime, the "phantom" contracts are being awarded to allow the builders to work up bills of materials, facility needs, and subcontracts in advance.

A similar program was run during the Korean war—the builders getting the green light from the government to produce specific quantities and types of machine tools before getting firm orders from arms producers. When the builders were unable to sell the machines later on, the government took delivery of the equipment. At last count, the government held title to 578 machine tools worth $7.6 million which had not been sold to military contractors. The total program covered 87,000 machine tools worth $1.4 billion.

The new program covers what Washington feels would be the first half-year's machine tool needs in case of full mobilization—about 15,000 tools with a potential cost of $250 million. ODM has set aside $21 million from the Defense Production Act's $2.1-billion Borrowing Authority to provide working capital advances if ever needed.

No Repeat of Korea

Commerce Dept's Business & Defense Services Administration recently told a Congressional committee that the Korean pool order program "failed to achieve the initial and short-term objectives of immediately accelerating and expanding industrial capacity to produce." It estimated that the Korean military buildup was delayed 12 to 18 months because of machine tool bottlenecks.

Presumably the new program takes care of all or at least most of these defects which BDSA noted in the old

Aircraft Industry Is First Target of

SAN FRANCISCO—Delegates to the quadrennial convention of the International Association of Machinists here September 4-14 voted 3-2 to establish a "defense and emergency fund" to up benefits to members on strike to $35 per week for a maximum of six months.

Benefits would start after $2 million had accumulated in the fund, to be built from a 50¢ per month per capita tax on the 900,000 plus membership. Previous strike benefits were $10 per week for an unstated period.

The action, along with others taken at the meeting, is subject to a referendum of the membership.

The vote was one phase of a general trend towards strengthening the IAM organization and the labor movement as a whole.

Strong Platform Adopted

In a series of resolutions, the delegates reaffirmed or added their support to these labor goals.

- A 30-hour work week.
- A guaranteed weekly and annual wage.
- Equal pay for equal work.
- Increased Social Security and Workmen's Compensation benefits.

As *American Machinist* went to press, the convention had yet to act upon one important item, the recommendations of IAM officers for strengthening the bargaining position of employees in the aircraft and guided missiles industry.

The IAM represents about 70%—more than 300,000—of the organized employees in the industry.

It was believed that in general, the convention would vote support of this report, which recommends:

- Councils should be formed uniting all IAM lodges bargaining with the same companies so that master contracts could be proposed. Master agreements should be negotiated with all companies who operate two or more plants.
- The IAM and the United Automobile Workers should conduct joint negotiations with companies under agreement with both unions. Cooperation has been growing between the two unions, progressing from "no raid" agreements to this year's close liaison in negotiations with the major aircraft and guided missiles manufacturers. Presumably UAW will favor joint negotiations—the convention received a telegram from UAW's Walter Reuther congratulating IAM on the success of the liaison.
- National recognition agreements should be sought with all employers in the industry.

Specific bargaining proposals of the aircraft group for the next round of negotiations include:

- A substantial wage increase, plus a simplified wage rate system, to protect employees from re-evaluation and downgrading.
- A full union shop in all branches of the industry.
- A job protection program for members affected by plant reloca-

High Gear

system: the contracts weren't "sufficiently definitive to allow a builder to carry out his production schedule on receipt of a 'go-ahead' signal from the government;" firm pricing schedules were missing in the contracts; no method was set up under which funds "would be appropriated and on hand to finish the Pool Order Program on M-Day."

Squabble Delayed Program

The new program was held up for several months by a squabble over price provisions in the contracts. In resolving this, ODM and GSA have decided to list prices prevailing on the date of the contract's execution. Then, every six months or so, the price schedules will be reviewed, and contracts will be amended to reflect changes the builders may have made in their prices. The price prevailing in the latest amendment to the contract will be the official price when and if the contract is activated during a national emergency.

IAM Drive

tion, including seniority severance pay, travel pay and relocation allowances.

• Improved health and welfare plans.

After various statements of nonpartisanship by IAM officers, the convention voted enthusiastic endorsement of the candidacies of three of its speakers, Democrats Adlai Stevenson, Estes Kefauver and Wayne Morse.

An invitation to speak, extended to Republican leaders, was not accepted by them.

An unusual highlight of the convention was the speech of a prominent industrialist, John I Snyder, Jr, president of U S Industries, who told the group that labor should be more active in speaking for the 40-million persons it represents.

"I don't think that labor nearly lives up to its promise," he said. "I think it is absolutely necessary that labor speak its mind thoughtfully on whatever problems are current."

Capital Goods Spending Running Slightly Behind Predictions–but Still High

WASHINGTON—The Government's latest Survey of Capital Expenditures by Industry shows that spending on new plant and equipment—though still at a record high level—is now running slightly behind earlier estimates:

• Second-quarter 1956 expenditures totalled $34.49 billion at an annual rate, down $400 million from the last estimate.

• Third-quarter spending is expected to hit $36.26 billion, $500 million below the previous estimate.

• Fourth-quarter capital expenditures are expected to total $38 billion at an annual rate.

Still at Record Levels

But the key figure—total 1956 plant and equipment spending—is estimated at $35.3 billion—23% over last year's record $28.7 billion. This assumes, of course, that industry's plant expansion will go along as currently reported to the government.

The new estimate for the year as a whole falls midway betwen the $34.9 billion reported last February and the $35.7 billion sum set last June.

The slight drops in April-June figures on actual spending and the July-September forecasts stem partly from strike-induced steel shortages. But a more likely reason is that expansion plans initially reported to the government was set unrealistically high, and that businessmen have been unable to ladle out funds for new plant and equipment as fast as they would like.

Machinery industries reported anticipated plant expansions costing $309 million in fourth-quarter 1956. For the year as a whole, that industry's capital spending will total slightly more than $1 billion, compared to $809 million in 1955 and $694 million in 1954.

In all manufacturing industries, expenditures on new plant and equipment will come to $15.2 billion in 1956—a 33% leap over last year's volume.

The latest figures, released jointly by the Securities & Exchange Commission and the Commerce Department, have not taken into account the possible impact of increased interest rates and all-around higher costs on American industry's expansion plans.

"Business is Buoyant"

Most Washington officials won't say how—if at all—the inflationary trend might eventually affect plant expansion plans. But at least one top official is inclined to be on the optimistic side. Says he: "Business is pretty buoyant." The scheduled capacity increases—especially in public utilities and steel—are geared more to long-range demand estimates, which are climbing, than to current economic factors, this official points out.

COMPARATIVE FIRST-QUARTER SPENDING FOR NEW PLANT AND EQUIPMENT 1955-56

(billions of dollars)

	January-March		April-June		July-Sept		Oct-Dec		'56 over '55
	1955	1956	1955	1956	1955	1956	1955	1956	% increase
Manufacturing	10.17	13.45	10.84	14.65	11.97	15.82	12.48	16.87	33
Durable goods	4.78	6.57	5.06	7.38	5.77	8.17	6.00	8.64	42
Non-durables	5.39	6.88	5.78	7.27	6.20	7.65	6.48	8.23	25
Mining	.80	1.13	.94	1.28	.99	1.32	1.08	1.28	29
Railroad	.74	1.25	.80	1.22	.96	1.32	1.17	1.53	43
Other transportation	1.46	1.65	1.62	1.63	1.60	1.85	1.70	1.99	12
Public utilities	4.01	4.56	4.09	4.61	4.43	5.20	4.48	5.31	16
Commercial, including construction, finance, service	8.46	10.78	8.90	11.10	9.70	10.75	10.54	11.02	13
ALL BUSINESS	25.65	32.82	27.19	34.49	29.65	36.26	31.45	38.00	23

Europe Lags Behind US Wage Rise

NEW YORK—European metalworking is a paradox today—while its technology draws closer and closer to advanced American methods, its wage scales are dropping farther and farther behind those of the United States. That's the opinion of Frederick S Blackall, Jr, president of Taft-Peirce Mfg Co, Woonsocket, R I, machine tool builders.

Mr Blackall, who has just returned from an extensive tour of European metalworking plants, found that in the four years since his previous visit European wages had failed to go up in proportion to those in U S metalworking. This was particularly evident in Western Germany, where technology and production practices compare favorably with those of the United States, but where the average machinist makes something less than 50¢ an hour.

Five-Nation Wage Comparison

Comparing machine shop wage scales in five of Europe's top producer nations, Mr Blackall found the British to be best paid. In England, a boring mill operator makes anywhere from 70¢ to 90¢ an hour. Average take-home pay for machine shop workers runs to about $33.60 for a 44-hr week, and automotive workers are reputedly paid nearly double that amount, although Mr Blackall believes this estimate to be high. British draftsmen are currently earning somewhere between $2240 and $2570 a year, or between $1.01 and $1.16 an hour.

Second best paid of Europe's machine shop workers are the Swiss and the French. In each of those countries, workers earn anywhere from 50¢ to 56¢ an hour in a workweek that runs 44 to 48 hours.

Average machine shop pay in West Germany is 48¢ an hour straight time for a 44-hr week. An unusually skilled worker can make as much as 63¢ an hour, for a monthly take-home pay of $120.

Lowest wage scale of the five countries is that of Italy, where an average machine operator makes 38¢ to 46¢ an hour, and highly skilled toolmakers, boring mill hands and machinists make 51¢ an hour. Italy's prevailing low wage scale is reflected in low prices, and in construction costs, etc.

Everywhere in Europe, the discrepancy between wages there and in the United States seems to have broadened in recent years—the primary reason, in Mr Blackall's opinion, why Europe can undersell the U S in world markets. Yet, in the case of England, despite far lower labor costs, the British seem to be unable to pass their labor savings along to the customer, and a number of Britishers privately told Mr Blackall they fear that England is pricing herself out of world markets—steadily losing ground to West Germany, Switzerland and Scandinavia.

Another trend evident to Mr Blackall was that in the four years between his tours of European plants, the workweek in most countries had shortened considerably. This was especially noticeable in Germany, which in its efforts to pull itself up by its own industrial bootstraps following World War II chalked up average workweeks of 60 hours and more. Today, the workweek is 44 to 48 hours in most metalworking plants. And Italy, for the first time in its history, is knocking off from work for a full week end.

West Germany is the country to watch these days—the people are working hard and efficiently at wages far below those in the United States, Mr Blackall reports. Work tempo compares favorably with that of a top U S shop and plant and machinery maintenance practices are excellent. Mr Blackall also noted widespread use of carbide tools.

Visiting the new Carl Zeiss Works at Oberkochen, Mr Blackall looked over the new Zeiss universal measuring microscope, had to borrow the German word "wunderbar" to describe it. At Zeiss, the use of tungsten carbide tools is practically universal, stepping up feeds and speeds, and actually the work tempo of the entire shop. And, Mr Blackall observes, if the plants of Heller, Carl Zeiss and Jung are representative, the Germans must be the world's best industrial housekeepers. The plants are spotless and beyond that have "an air of quiet efficiency and crisp dispatch."

Of the "amazing little grinding machine plant" of Karl Jung at Goeppingen, Mr Blackall observes, "I have never seen a finer example of the fabled German technical efficiency . . . it is unique in having been built to operate almost autonomously in the manufacture of a single machine tool—the Karl Jung surface grinder. The plant operates at its full capacity of one machine per day, is sold out for many months ahead, and orders in excess of the plant's capacity won't be accepted."

Herr Dr Hofmann of Jung has some startlingly unconventional ideas in production and control methods. For instance, he doesn't have just one office, he has one in every department, spending a certain amount of time in each every day so he won't lose touch with every facet of production. Some more of Dr Hofmann's ideas:

- Every machine in the plant is replaced with a brand new model when it becomes five years old.
- Subassemblies are put together by operators seated at individual tables provided with drawers and shelves for parts.
- All machines are operated at predetermined optimum feeds and speeds, employ modern high-production cutting tools.
- Snagging of castings is completely eliminated by shotblast.
- Hot paint or lacquer is used in the spray-finishing of machine bases and other painted parts. This eliminates use of thinners and speeds drying materially, requires less paint, and produces a superior finish.

To Mr Blackall's surprise, practically no U S machine tools were used in the German plants he visited. Most of them are of German make, plus some from Britain, France, Sweden, Italy, and Switzerland, and one or two from Czechoslovakia. Incidentally, Mr Blackall was told that Iron Curtain machine tools are of reasonably good quality but are lacking in new ideas, being for the most part copies of existing machines and older models. The machine tool industry is active in Czechoslovakia and in Eastern Germany—particularly near Berlin.

"The impact of American methods and procedures is quite evident in Western Germany," Mr Blackall says, "particularly in new building, which is going on at a rapid rate to replace bombed-out structures. American manufacturing methods have left their mark in Germany, too, for their present-day practices compare very favorably with ours."

Modern Equipment Turns Out the GM-Holden Car in Australia

FIRST ALL-MADE-IN-AUSTRALIA AUTOMOBILE, the Holden, produced by General Motors' Australian subsidiary at Fishermen's Bend, Victoria, is turned out on lines as modern as those of Detroit. Left: the front-axle line.. Right: making small parts for the Holden. Both photos were taken at the huge Fishermen's Bend plant

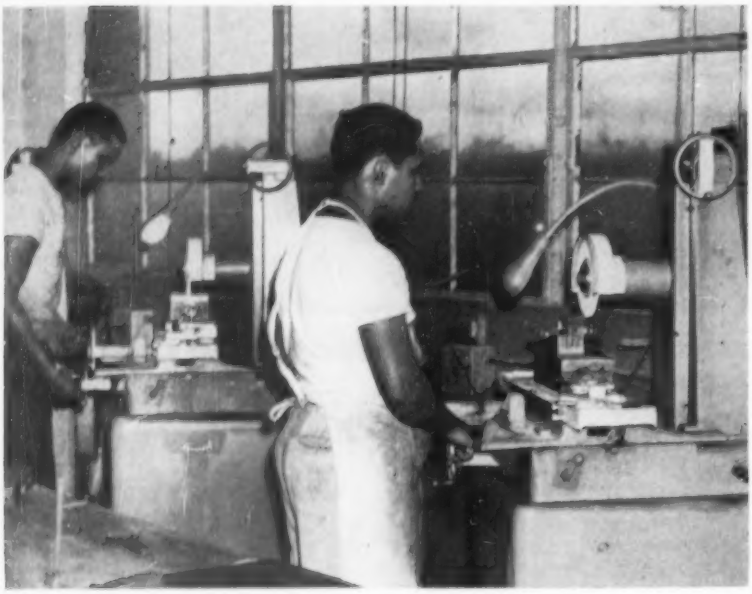
World newsbriefs

(McGraw-Hill World News)

First assembled-in-**Japan** jet fighter has successfully completed test flights at Komaki. It's an F-86F Sabre Jet, assembled at Mitsubishi with parts and technical assistance provided by North American Aviation. By the time the program phases out in August of next year, Japan will have turned out some 70 F-86F's, assembling them from parts made in North American's Los Angeles plant . . . Two U S firms are paying increased attention to the **Australian** market these days: International Harvester is expanding its manufacture of industrial power equipment, road and farm machinery there, and Black & Decker is setting up a $750,000 plant near Melbourne to make portable electric tools . . . Also slated to set up shop in **Australia** is Britain's Hawker-Siddeley Group, which will fabricate aluminum buildings there . . . **Argentina** is buying 25 diesel locomotives on a deferred payment plan from Montreal Locomotive Works Ltd of **Canada** . . . **Spain's** Sociedad Anonima de Fabricacion de Automoviles Diesel has been set up in Madrid to make small automobiles and trucks with diesel motors. Output is slated at 2000 vehicles for the first year, will ultimately reach 6000 a year . . . Pastushin Aviation Corp of Los Angeles will manufacture headless rivets for Douglas military jet aircraft at its **Puerto Rican** affiliate, Aero Components Inc. Rivets will be cold-headed, heat-treated and alumilited at a rate of 50,000 a week by year's end . . . **England's** Rolls-Royce Ltd is going in for the railroad market with installation of two 238-hp unsupercharged horizontal, 8-cyl oil engines in a British railways motorized coach and trailer coach . . . Fruehauf Trailer Co of **Canada** is building a $3-million truck trailer plant on a 71-acre site near Toronto . . . **Great Britain, France, Italy** and **Sweden** are all competing for a contract to supply the new **West German** army with a submachine gun or machine pistol, and **Germany's** Erma-Werke hopes to manufacture Britain's Sterling Mark III submachine gun under license. Initial order is expected to run to 15,000 weapons . . . Teams from **Russia** and **Britain** are slated to arrive in India shortly to advise the **Indian** government on the manufacture of heavy machinery and equipment. Scheme involves setting up of several foundry and forge shops . . . Although **Czechoslovakia** plans to manufacture a very small "People's Car" soon, that country's government evidently has little faith in it, plans to replace it with a larger model as quickly as possible . . . Low-temperature welding is being done in **Brazil** for the first time, under license to and using the machinery of All-State Welding Alloys Inc, White Plains, N Y . . . **Russia's** Stalingrad Tractor Works has just turned out its first DT-61 diesel farm tractor. It's half-a-ton lighter than its previous counterpart . . . **England's** Armstrong Siddeley Motors Ltd is recruiting girls under 21 to do research and development work on gas turbines and rockets. The girls, who will be given engineering training, will be required to analyse engine test results and other problems of engine stress and weight . . . **Japan's** Ministry of International Trade & Industry has drawn up a five-year machinery export plan aimed at exporting some $700 million worth of machinery, principally to **Southeast Asia,** by 1960. Planned exports include autos, rolling stock, textile and electrical machinery, sewing machines, machine tools . . . **Czechoslovakia** will deliver a five-ton-capacity electric smelting furnace to a **Brazilian** firm in November . . . **British** automakers are plenty mad at the **Norwegian** government, which they claim discriminates against British automobile imports on the one hand, while at the same time permits the free importation of automobiles from Eastern European countries—presumably meaning Russia and her satellite nations.

Pioneering in Puerto Rico

10%-a-Month Sales Jump Makes Game Worth the Candle



These were farmers not so long ago . . .
The Monitor Industries worker on the left is a trainee. He's squaring a block under the supervision of the machinist (right), who has four years' experience

A modern shop thousands of miles from home base . . .
that's Monitor Industries 11,000-sq-ft tool and die plant outside San Juan. This newly established affiliate of a Rockland, Mass, firm has to be able to handle a tremendous variety of jobs—anything from rough emergency repairs to the island's obsolete machines to ultra-precision tool and die work

HATO REY, PUERTO RICO—How'd you like to run a business that ups its sales as much as 10% every month, with no corporate federal taxes to pay and a 10-year exemption on local taxes? That's the payoff that Monitor Industries is enjoying for its willingness to pioneer the tool and die industry in a Spanish-speaking island that not so long ago resounded to the swish of machetes cutting sugar cane rather than to the hum of machine tools.

But it hasn't been all beer and skittles, or maybe you ought to say rum and coke down here, and zooming sales. Just 10 months back, when Monitor Industries decided to set up a branch operation in Puerto Rico, it did so with plenty of worry over just how to keep things going smoothly in an area where industrial skills have yet to be mastered completely.

Today, Monitor operates a middle-sized shop employing 20 local workers and three from the U S mainland. It's geared to handle a wide variety of jobs—from rough repairs to assignments requiring tolerances of 0.0002 in. or less.

Equipment includes lathes of 9- to 18-in. capacity, surface grinders with up to 18-by-24-in. chucks, vertical millers up to 1-in. capacity, Van Normans, horizontal mills, shapers, radial drills, bandsaws and heat-treating units. The shop is near San Juan, Puerto Rico's bustling capital city, center of the island's industrial expansion.

Says Monitor's general manager, Lawrence B Simons, "the fact that Monitor's new operation is profitable, and that we expect to double current capacity by the end of next year indicates that we are successfully meeting the challenge of running a precision shop in an area which up to 1946 creaked along on an agricultural economy."

What made Monitor set up a branch operation in a Spanish-speaking area more than a thousand miles from home? Here are some of the reasons, according to Mr Simons:

• **An ever expanding market:** demand for tool and die work in Puerto Rico is on the upswing. The Com-

monwealth's industrialization program, as implemented by the Economic Development Administration, so far has attracted 402 U S mainland companies to the island. By mid-1963, EDA expects to double this total to 905 more potential customers for Monitor Industries.

• **Tax savings:** because Puerto Rico, a democratic self-governing Commonwealth freely associated with the U S, has no vote in Washington, industry there is exempt from federal corporate taxes, yet enjoys the full protection of the American flag. In addition, as a resident company, Monitor is exempt from local taxes for 10 years after start of operations. To qualify for this aid, Monitor had to prove that its operation represented genuine expansion—not "runaway" industry which could cause unemployment back home.

• **Added benefits:** EDA considers Monitor's type of operation essential to Puerto Rico's industrialization, encouraging expansion of new industry looking for technical services. In addition, Monitor gets some financial assistance toward the salaries of two technicians who train locally recruited apprentices.

• **Labor savings:** hourly wages for regular tool and die work average $1.40, compared to $3.25 to $3.50 in the U S mainland.

• **Growth of local technical force:** the island's 11 vocational schools now graduate 6500 students, a number of them machinists and mechanics. The University of Puerto Rico in the years 1915-1942 graduated only 500 engineers. Today, under the impetus of industrialization, 1500 engineers have graduated from the University since 1942.

But there are drawbacks too:

• **Higher operating costs:** raw material costs are generally 5-10% higher than in the States because of freight fees. Flat ground stock (1 x 3 x 18), delivered, costs $19.60 in Puerto Rico as compared to $18.50 back home. For special jobs Monitor must maintain a relatively high inventory or fly in needed materials at a 20% higher cost.

You pay more for power in Puerto Rico. Industrial power from the Puerto Rico Water Resources Authority costs 3.25 cents per kwh for the first 100 kwh per month per horsepower of connected load. For the next hundred the rate drops 2.50 cents per kwh.

• **Higher job time costs:** in an area where the swish of the machete has yet to fade completely, it is understandable that job time for tricky or close tolerance work is generally 75% longer than on the U S mainland. The newly trained Puerto Rican machinist requires close supervision at the rate of $4 to $5 an hour in jobs that Stateside machinists complete on their own from design right through to tooling. But for rough repairs, the Puerto Rican is equal to his counterpart in the States, and job time should be cut appreciably in the next two years.

Monitor's most promising workers are now going through an intensive training program as diemakers' assistants—learning to build and repair dies, make punches and die sections, locate sections of dies on die sets, and learning to time dies, read blueprints and further perfect their skills as machinists.

Monitor's line trainees serve a six month tour in its recently established press department, followed by stints in shaping, milling, and squaring up blocks. The new press department now accounts for 25% of gross sales, generating work for the whole tool and die shop by running off electronics parts, jewelry findings, metal parts for dolls and other fabrications.

In essence, Monitor is successful in Puerto Rico, according to Mr Simon, because of: tax and labor savings, assistance from ECA, and a fast expanding market (U S mainland branch plants are opening at a rate of 10 a month) plus orders from local Puerto Rican manufacturers seeking to replace outmoded equipment.

East...

Eastern briefs . . .

Recent statements in the press (we were guilty, too) to the effect that **Van Norman Industries** is acquiring control of the common stock of **American Pulley Co** through an exchange of stock have been denied by the latter company. Says American Pulley's Treasurer Frank E Brown, ". . . there has been no exchange of stock between Van Norman Industries and the American Pulley Co . . . the shares involved had been accumulated during the past two years by a New York investment firm, and it was these shares (and these shares only) which Van Norman Industries has acquired by exchange for their (Van Norman's) shares." The 12,128 shares of American Pulley stock represent only 20% of the shares outstanding . . . Look for **Alan Wood Steel Co,** Philadelphia, to go in for production of powdered iron by the end of next year . . . **Radio Condenser Co,** Philadelphia, will drop production of TV tuners because of the dog-eat-dog competition in that field, will diversify into output of magnetic clutches . . . **Minneapolis-Honeywell Regulator Co** has bought the former 250,000-sq-ft Hathaway plant in Boston, will move its Transistor Division there from Minneapolis . . . **Curtiss-Wright Corp,** Wood Ridge, N J, has a $10-million contract to overhaul engines for the Flying Tiger Line. It's said to be the biggest contract of its kind in history . . . **Karp, Lesser & Co Inc** has been set up as a consulting organization to sheet metal fabricators and allied industries by Daniel S Karp, former president of Karp Metal Products Co, Brooklyn, and his former assistant at Karp, John Lesser. New firm's address is 60 E 42nd St, New York 17 . . . **Sylvania Electric's** Parts Division has taken over Ruel H Smith Enterprises' 45,000-sq-ft plant at Titusville, Pa . . . Impending layoffs at **Frankford Arsenal,** Philadelphia, have been staved off for a year with a new $2-million contract for 90mm shells. Also headed Frankford's way are orders for ammunition for the T-44, the rifle that will replace the Garand M-1 and will be standard with the U S and allied armies . . . **R M R Co,** a new manufacturer of fractional hp electric motors, will be in full production at Elkton, Md, by November 1. R M R is hiring 80-100 women workers October 15, will employ 200-250 within a year . . . **Baldwin-Lima-Hamilton Corp** has consolidated all its Electronics and Instrumentation in a new $3-million plant at Waltham, Mass.

West...

Western newsnotes . . .

Curtiss-Wright Corp, Wood Ridge, NJ, will construct a 74,000-sq-ft plant in North Hollywood for its **Caldwell Wright Division.** It'll be used for overhaul of C-W aircraft engines, will be in operation at year's end . . . **Packard-Bell Co,** Los Angeles, has a $2-million Navy contract for airborne electronics identification equipment . . . **Boeing Airplane** employ-

ment in Washington State has passed the 45,500 mark, topping the World War II peak of 45,008. Increasing employment schedules will include Everett, north of Seattle, where Boeing has permission to use the Everett Navy Shipyard, will need 500 workers there . . . $20-million Air Force order for **Lockheed's** T-33 will extend production to mid-1958, up total of these jet trainers to 5500 . . . **Pacific Airmotive Corp,** Burbank, is getting work going at its Chino, Calif, division to turn out a $5.5-million order from the Air Force for overhaul of 293 C-47 aircraft . . . **Pacific Scientific Co** has completed a 31,000-sq-ft furnace plant-regional headquarters building in the Los Angeles area . . . **Aeroquip Corp** of Burbank has taken over **General Logistics Corp** of Pasadena, manufacturer of load control and tie-down equipment for aircraft and trucks . . . **Industrial Tectonics** is building a new western division plant in Compton, Calif, will produce anti-friction bearings. 30,000-sq-ft unit replaces Los Angeles facility acquired last year . . . **Lear, Inc,** has opened a research and development building for advanced aircraft instrument work adjoining its Santa Monica, Calif, facilities at the Municipal Airport. Unit houses Lear's 100 specialists working with engineers of company's western customers . . . **Arnolt Corp** of Warsaw, Ind, has opened a new Aeronautical Division in Los Angeles, increasing aviation products volume by 50%.

Midwest...

Midwestern rounds . . .

Yes, Virginia, there *will* be a 1957 Packard; new models will be announced in mid-January. **Studebaker-Packard** is girding itself to sell 150,000 cars and trucks worldwide next year as against this year's expected 95,000 . . . **heffield Corp** has set up a research and development division at Dayton concentrating on instruments, controls, machines, and systems for "autometrology;" automatic measuring systems developed will be used to maintain quality and control inspection costs in automated plants . . . Auto makers apparently couldn't sell the Roberts Committee the idea that higher and higher horsepower was a vital safety necessity. Congressional proposal for a tax on horsepower may come out of recent hearings held in Detroit . . . **Thor Power Tool Co's** factory sales and service branch in Detroit has moved to new, larger headquarters at 14515 Puritan Ave. Company's 25th branch will be opened in Indianapolis later this year . . . **Ford Motor Co,** after a 43-year-old hold-out, has joined the Automobile Manufacturers Association. Company had maintained an independent, non-member status, conforming to policy laid down by Henry I years ago . . . **J I Case Co** of Racine, Wis, and **American Tractor Corp,** Churubusco, Ind, have approved merger plans; companies will operate under the Case name. Move will give Case a big entry into construction and road building fields with a line of crawler tractors and road building equipment . . . **General Motors'** Allison division, Indianapolis, has been awarded a $13-million Air Force contract for technical data for J-71 turbo-jet engines . . . **Almco Division,** Queen Stove Works, Albert Lea, Minn, will award prizes of $250, $100, and $50 in its new Supersheen contest ending Dec 31. Firms using Almco barrel finishing equipment are eligible; the one that comes up with largest total dollar savings and greatest percentage of savings as compared to previous methods gets top prize . . . **Gardner-Denver Co** and its **Keller Tool Division** is set to move into its newly built facility at 12700 Capital Ave, Oak Park, Mich. 6300-sq-ft building will house general and sales offices, warehouse, storage areas, and a repair shop . . . **Apex Electrical Manufacturing Co,** Cleveland, is merging with **White Sewing Machine Co** . . . **Racine Hydraulics & Machinery Co,** Racine, Wis, has purchased a new facility; the 25,000-sq-ft-area of Plant No. 2 will be used for manufacture of expanding line of railroad maintenance and power hacksaw equipment . . . **Superior Brass Works,** Detroit, has purchased machinery, equipment, and inventory of **Kendrick Manufacturing Co,** will operate it as a division. Both companies make cast bronze bushings and bearings; joint sales total $2.5 million annually . . . **Arnolt Corp,** Warsaw, Ind, has bought a plant containing 104,000 sq ft of manufacturing space, plus 100 acres of land at Pierceton, Ind . . . **GM's ElectroMotive Division** expects to be using a 5-bay section of the 14-bay building being added to the La Grange, Ill, plant by end of October. Project, scheduled for completion by end of '57, is for fabrication of larger body parts for diesel-electric locomotives . . . **Food Machinery & Chemical Corp** has acquired **Hudson-Sharp Machine Co,** Green Bay, Wis, in an exchange of stock, will operate it as a subsidiary.

South...

Southern shorts . . .

Pratt & Whitney Aircraft Division of United Aircraft will build a $42-million jet engine plant and test center on 7000 acres of land east of Lake Okeechobee, Fla. United will finance construction; 2000 engineers and technical personnel and "several thousand" production workers will be required when production starts . . . **Armco Steel Corp** will construct a heat treating plant at its **Sheffield Steel Division** in Houston, Tex. Building, with 45,000 sq ft of floor space, will house facilities for heat treating, tempering, normalizing, and annealing special alloy steel bars and plates . . . Southeast is about to get its first chain-saw plant. **Homelite Division** of **Textron, Inc,** is building a $2-million plant at Gastonia, NC, scheduled for completion next fall . . . **Southern Machine Co,** textile machinery manufacturer, is doubling capacity by consolidating its Fort Oglethorpe, Ga, and Chattanooga, Tenn, operations in a newly acquired building in Chattanooga . . . **Ranco, Inc,** Columbus, Ohio, is setting up a new research and development laboratory at Fort Lauderdale, Fla, to concentrate on controls for household appliances and air conditioning . . . **Capitol Tool & Die Co,** a new Nashville, Tenn, firm, has opened its doors for business . . . **Kaiser Aluminum & Chemical Corp** will build a pilot plant at Nichols, Fla, to extract a chemical from phosphate wastes . . . **Lyon, Inc,** Detroit wheel manufacturer, is building a new plant at Huntland, Tenn; it'll turn out buffing wheels for polishing stainless steel, and a flat plate line for making stainless tableware and utensils . . . **General Electric** is putting up a 135,000-sq-ft building at Murfreesboro, Tenn, for manufacture of appliance motors . . . **Lockheed Aircraft Corp** has a $4.5 million Air Force contract for a nuclear power project at its Dawsonville, Ga, plant now under construction . . . **Helical Tube Corp,** Grand Rapids, Mich, producer of stainless steel tubing, has leased space in Bullard Industries' Newport, Tenn, plant.

Earl R Lewis, Jr, has been named production manager of Pratt & Whitney Co's Cutting Tool and Gage Divisions. He has held various supervisory posts in the divisions since 1940

Donald P Ridgeway has been appointed manager of Illinois Tool Works' Spiroid Gear Dept. He was formerly vice president, sales and engineering, of Janette Electric Manufacturing Co, Morton Grove, Ill

Stanley R Cope, president of the Acme School of Die Design Engineering, South Bend, Ind, will be awarded the metal stamping industry's Presteel Award for 1956. Established in 1954 by the Worcester Pressed Steel Co and the Pressed Metal Institute, the award will be presented at PMI's annual convention Sept 30 to Oct 4 at Pocono Manor, Penna. Mr Cope is a former board director of PMI, a member and past chapter chairman of the American Society of Tool Engineers, and author of 29 articles on design of drawing dies in *AM*

Names in the News . . .

Henry A Lundy has been elected vice president of Hardinge Brothers, Inc, Elmira, NY.

Courtlandt S Gross, executive vice president of Lockheed Aircraft Corp, Burbank, Calif, has been elected president to succeed **Robert E Gross** who will continue to serve as board chairman and chief executive of the company. **Daniel J Haughton,** a vice president, and general manager of the Georgia Division, has been named executive vice president of the corporation. Other appointments at the Division: **H Fletcher Brown,** manufacturing manager, to assistant general manager, succeeding **A Carl Kotchian** who takes over Mr Haughton's former post; **Ralph J Osborn,** assistant manufacturing manager, to manager; **R A Mackenzie,** production manager, to assistant manufacturing manager; **H Lee Poore,** assistant production manager, to production manager; **William B Rieke,** director of material, to assistant production manager; and **Nicholas Ricciardi,** purchasing department manager to succeed Mr Rieke.

Joseph H Coleman has been named plant manager of Firth Machine & Tool, Inc, Fostoria, Ohio.

Frank C Hawk has been named general manager of Bohn Aluminum & Brass Corp's new Betz Division, Danville, Ill. The division, formerly Betz Corp of Hammond, Ind, manufactures products for the air conditioning and refrigeration industries.

G H Rearick, Milwaukee plant manager of Babcock & Wilcox Co's Tubular Products Division, has been named to the staff of the company vice president whom he will assist on special work assignments. **Norman E Wenzel,** assistant plant manager, succeeds Mr Rearick.

George Q Mathews, sales manager of Huck Manufacturing Co, Detroit manufacturer of fasteners and driving tools, has been appointed vice president, sales.

E J Fogel has been promoted from superintendent to manufacturing manager of Westinghouse Electric Corp's industrial gas turbine department.

John A Lindberg, formerly associated with Continental Can Co, has been named manager of manufacturing operations at E W Bliss Co's Mackintosh-Hemphill Division. **Thomas H Pattison** has been appointed manager of the Pittsburgh Plant

Alfred D Stevens, formerly quality control manager of Kennametal, Inc, has been appointed assistant general manager of Willey's Carbide Tool Co, Detroit.

E J Formhals has been appointed general manager of Canadian operations of Progressive Welder, Canada Ltd, with headquarters in Chatham, Ontario. He was formerly associated with American Steel Foundries.

Charles J Stofko has been named general manager of the Barnes-Gibson-Raymond divisions of Associated Spring Corp at Plymouth and Ann Arbor, Mich. He was formerly factory manager of Wallace Barnes Co, the Bristol, Conn, division.

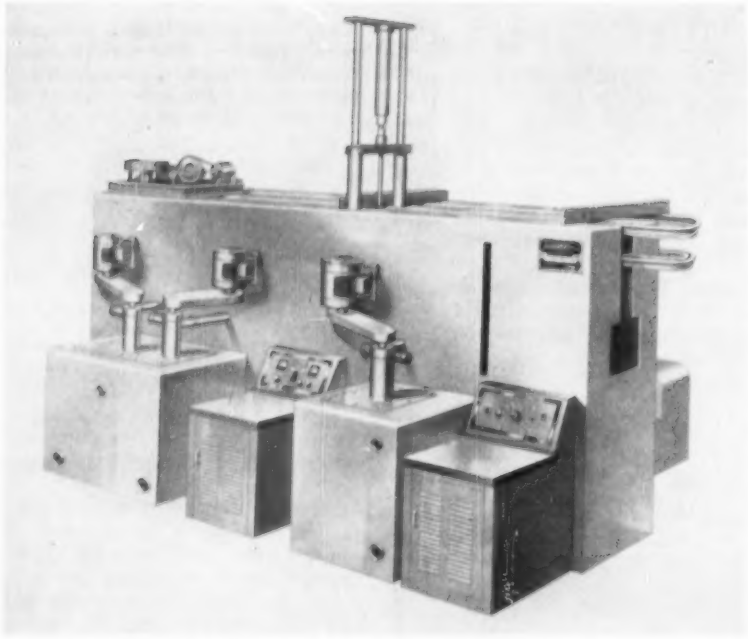
Gaspar Roca, Jr, has been named mainland director of industrial development for Puerto Rico's Economic Development Administration. Mr Roca, who has been serving as vice president, finance, of EDA's Puerto Rico Industrial Development Co in San Juan, will be in charge of New York headquarters as well as the Chicago and Los Angeles offices.

OBITUARY

Benjamin Komins, 62, a founder and president of the Penn Tool Co and the HP Tool Manufacturing Corp, Philadelphia, died Aug 29.

Metal Show | in print

New products to be introduced at the Metal Show are described here. All will be on display, along with many others previously described in American Machinist, *at Convention Hall, Cleveland, October 8 to 12. Hours are Noon to 10 pm (Monday through Wednesday), 10 am to 6 pm (Thursday and Friday)*



Ransohoff Ultrasonic System Cleans Parts Automatically

Five-stage Monorail ultrasonic cleaning system combines a single ultrasonic cleaning stage with more conventional wash, rinse, and dry sections. Parts are carried through the machine on an automatic indexing double monorail conveyor. Ultrasonic unit, made by Bendix, is said to provide faster, cheaper cleaning of parts and assemblies than the usual types of cleaners.

Parts are loaded on fixtures traveling on the conveyor. In the ultrasonic section, parts are automatically lowered into the tank, where high-frequency sound waves break contamination loose. In washing, rinsing, and drying sections, parts are subjected to sprayed wash, rinse solutions, and drying air.

Solution tanks and drying air are heated electrically. Machine is placed in operation by pressing button; parts then proceed through cycle automatically, emerging thoroughly cleaned and dried.

Ransohoff, Inc, North 5th & Ford Blvd, Hamilton 2, Ohio

Steel City Cup Tester Checks Ductility of Thin Metals

Model D cup tester, designed for testing thicknesses from 0.003 to 0.062 in., can be used for testing such metals as copper, brass, aluminum, tin plate, and stainless and carbon steel. Bench-mounted unit is hydraulically operated, with power supplied from a 1/6-hp motor mounted on rear of base, which incorporates tank of hydraulic oil. Two valves on front of base provide infinite control of testing operation.

Depth of cup is shown by dial indicator, which is fitted with friction brake so that maximum deflection readings are retained until released by operation. Maximum load at time of yield is shown by red "lazy" hand on load gage. Device has ball penetrator with ⅞-in. diameter, and die supplied is of 1-in. diameter. It is 25 in. high, has size of 11½ x 21 in.

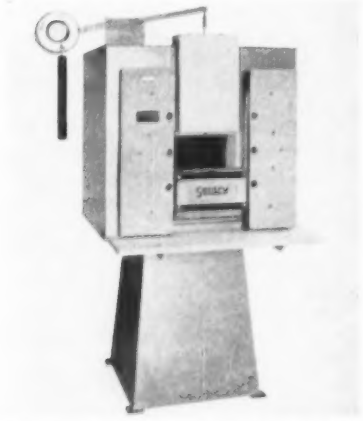
Steel City Testing Machines, Inc, 8817 Lyndon Ave., Detroit 38, Mich

Ajax Salt-Bath Furnace Has Easily Removed Electrodes

Featuring removable submerged electrodes which can be changed in an hour, before the molten salt has solidified, salt-bath furnace is designed so that electrodes can be replaced without costly furnace shutdown. Electrodes are fabricated of non-critical alloys, and enter the pot from over the top instead of through the back wall of the casing. Hence there are no openings below the surface of the salt. Removable tile over each pair of electrodes seals off all air, preventing oxidation attack on the electrodes and extending their life.

Furnace is also said to have a pot life of up to ten years. Bulletin 810.

Ajax Electric Co, 912 Frankford Ave, Philadelphia 23, Penna



ELECTRIC HARDENING FURNACE, Model Y, is offered in redesigned version. Using company's Diamond Block method of atmospheric control, furnace produces hardening free from scale or decarburization on all types of tungsten, cobalt, and molybdenum high-speed steels and high-carbon, high-chrome die steels. Automatically constant atmosphere requires no adjustments—*Sentry Co, Foxboro, Mass*

Cima Universal Hobbing Machine Is Designed for High-Speed Work

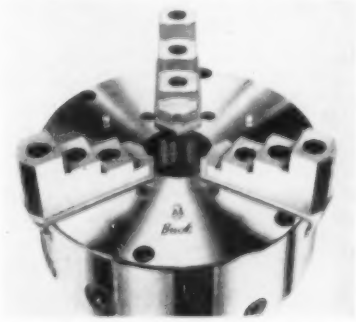
Cima P3 hobbing machine, a product of Italy, generates involute gear teeth by means of a hob. Typical applications include production of spur gears, spline shafts, helical gears, worm wheels, and worms.

Main drive of machine is performed by a motor located inside the machine base. Standard cutter head is fixed to the vertical slide by means of wide T-splines; vernier-graduated scale enables its inclination to be adjusted within 5 min of arc. Also provided is a supplementary slide which accommodates a tangential cutter head for tangential feed of the hob with respect to work.

Differential mechanism, which provides automatically the supplementary rotation to the table to produce the helix angle, is located in advance of the index change gears. Disconnecting or changing feed does not disturb the correlation of hob and work. With this system a variety of helical gears having different numbers of teeth but of the same pitch and helix angle can be cut with the same setup of differential change gears.

Automatic feeds are obtained by change gears. Rapid traverse is controlled by same lever that drives the automatic-feed motion. Machine will hob a maximum diameter of 9⅞ in., with maximum PD of 9.

Imported by George Scherr Co, Inc, 200 Lafayette St, New York 12, NY



DUST-PROOF CHUCK is intended for grinding machines and dividing heads, wherever abrasive dust and metal chips are a problem. Maker claims that device is the only dust-proof chuck with a hole through the center, and that full capacity range of chuck can be utilized, without interference from dust-proofing mechanism. Chuck can be used either dry or wet—*Buck Tool Co, 2015 Schippers Lane, Kalamazoo, Mich*

Wheelco Controllers Monitor Batch-Process Operations

Series 150 Amplitrol non-indicating controllers, potentiometer-type units designed for control applications in batch-process work, are available in two types. Devices employ a circuit in which the unknown voltage is connected in opposition to a known voltage, with any difference used to actuate the control circuit. Sensing element provides the unknown voltage in the circuit. Known voltage corresponding to the control point desired is imposed from a separate source to the other side of the circuit. The difference between these voltages is fed into a saturable core reactor, amplified, and used to control firing of a thyratron.

Model 151 is a simple on-off controller for those applications where transfer lag and dead time can be reduced to a negligible value and the simplest of control forms made usable. Model 152 is an "anticipatory" time-proportioning controller which compensates for system inertia, starting or stopping the control device slightly ahead of the normal "on" or "off" point.

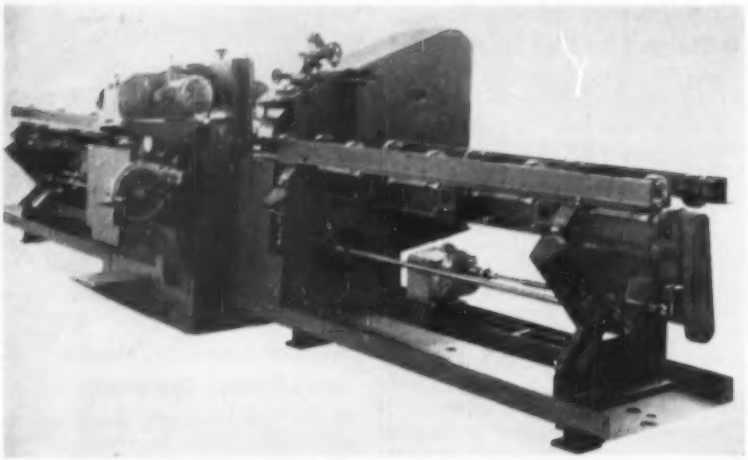
Typical applications include salt baths, pickling tanks, tinning and galvanizing pots, and non-ferrous melting furnaces.

Barber-Colman Co, Wheelco Instruments Div, Rockford, Ill

Seamless Steel Tubing

Seamless steel tubing, designated NP-60, can be used for the manufacture of such items as locknuts and bearing collars. Tubing is available in the lower carbon range, up to AISI C-1025. Company reports that special manufacturing process used in development of tubing results in a considerable improvement in free machining quality.

Ohio Seamless Tube Div, Copperweld Steel Co, Shelby, Ohio



Centerless Grinding, Finishing Machine Features Traverse Reversing Device

Type 614 centerless grinding and finishing machine is of heavy construction, and is built for grinding and finishing tubes and bars at production rates. Abrasive-belt feed unit is mounted on heavy cast-iron dovetail ways and is regulated by feed screw with micrometer handwheel. Wheel spindle, of taper-nose design, is mounted on heavy precision bearings.

Machine can be equipped with steel contact wheel for heavy stock removal, using coarse or medium-grit coated abrasive belts. In a matter of minutes, both contact wheel and belt can be changed for smooth, mu-in. finishes.

Unit can be equipped with a traverse reversing device which may be operated manually or automatically. This device permits reverse of traverse direction, so that as many passes as necessary can be obtained without work having to be re-handled. Feature can be built into any of company's other centerless machines.

Specifications: capacity, ¼ to 4 in.; belt speed, 3500 sfpm; size of grinding belt, 6 x 168 in.; size of feed belt, 6 x 47 in.; contact wheel, 6-in.-dia x 6-in. face; feed drive motor, 1 hp; main drive motor, 15 hp.

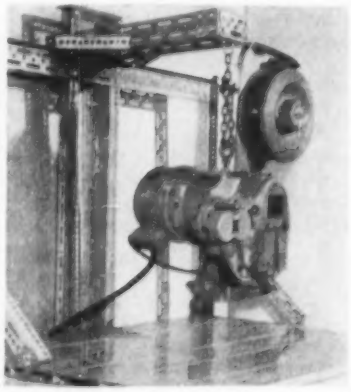
Production Machine Co, Greenfield, Mass

Stokes Vacuum Furnace Permits Precision Casting

Production vacuum furnace is of a size and design that make it practicable for use where large-capacity casting furnaces are not required. Work handled can include such products as jet-engine components and automotive and electronic parts.

Furnaces incorporates many features of company's previously announced larger vacuum furnaces for refining and casting high-purity metals under vacuum by investment-casting or permanent-mold techniques.

F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna



SEMI-PORTABLE METAL STITCHER, Model N2P5, functions the same as company's floor model, but is portable to the extent that it can be mounted in almost any position—horizontally, vertically, or upside down. With this feature, work to be stitched does not have to be turned to be placed on the machine. Illustration shows model suspended from a cantilever—*Acme Steel Co, 2840 Archer Ave, Chicago 8, Ill*

Consolidated's Leak Detector Tests Pressure or Vacuum Systems

Responding to the presence of helium used as a tracer gas, Type 24-210 leak detector is said to be capable of the most exacting tests of either evacuated or pressurized systems. It may be employed to show the existence or absence of any leak, to determine the rate of leakage, or to find the exact location of a leak.

Device will detect one part of helium in 300,000 parts of air. Start-up time is only twenty minutes; vacuum system can be left in operation overnight, thus cutting warm-up time to a few minutes.

Diatron-4 mass-spectrometer tube is used to detect helium in the presence of other gases; tube ionizes all gas molecules, separates them by molecular weight, then focuses helium ions into an ion stream which can be converted to electrical current and registered on a control meter.

145-lb instrument measures 18½ x 22 x 20½ in., has simplified controls. The cold trap necessary for removing condensable gases has been eliminated from this model, according to company, by good vacuum-geometry design and use of a high-speed pump.

Consolidated Electrodynamics Corp 300 N Sierra Madre Villa, Pasadena Calif

Houghton Rust Preventative Is Non-Volatile

Indoor-type multi-purpose rust preventative which can be mixed with water, oil, or solvent, or used neat, is identified as Rust Veto MP. When mixed with water, base material produces a non-volatile solution which is helpful in improving plant safety conditions.

E F Houghton & Co, 303 W Lehigh Ave, Philadelphia 33, Penna

Starrett Hole Saws Have Welded-Edge Construction

Line of shatterproof, heavy-duty hole saws is designed to cut holes from 9/16 through 6-in. diameter in any machinable material up to 1⅛ in. thick. They are particularly recommended for use with portable power tools with ½-in. or larger chucks and on machine tools such as lathes, drillpresses, and radial drills.

Double welding combines HSS cutting edge with shatterproof body which is welded to a rigid steel cap threaded to accommodate interchangeable arbors. Arbors are available with ½ or ¾-in. hexagon shanks and also with a ¼-in. round shank. A ¼-in. HSS pilot drill is incorporated into each arbor.

L S Starrett Co, Athol, Mass

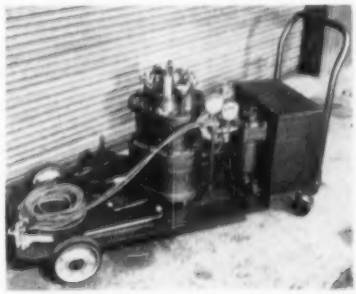
Hydraulic Tube Fittings For High-Pressure Systems

Line of hydraulic tube fittings, called 7000 Series Ermeto, is of flareless, straight-thread design. Intended for high-pressure systems, fittings are offered in 31 different styles in sizes from ⅛ to 2 in.

Devices are designed to accommodate minimum close coupling, positive seal, and ease of assembly. Black-phosphate finish is resistant to non-flammable hydraulic fluids as well as petroleum-base fluids. Fittings are intended for use with SAE O-ring boss, withstanding high operating pressure without use of backup rings. O-ring seal is also designed for air applications and tested to operate at temperatures from –65 to 212 F. Bulletin is offered.

Weatherhead Co, Ft Wayne Div, 128 W Washington, Fort Wayne, Ind

TWIN-BELT SURFACING MACHINE uses opposed abrasive belts as cutting media; each belt is backed by a hard or cushioned platen, depending on work being handled. Performing two operations in a single pass, unit has two heads adjustable to take work up to 6 in. wide. Illustration shows closeup view of unit equipped with rotary feeding fixture; with this device, both ends of slug stock are ground simultaneously at high rates—*Production Machine Co, Greenfield, Mass*



PORTABLE SPRAY COATING UNIT is airless, utilizes no atomizing air at the spray gun, and therefore minimizes the overspray problem. Device applies hydraulic pressures, 400 to 600 psi, to heated finishing materials, in order to achieve complete atomization of materials. Advantages of system, according to maker: reduced paint costs, reduced health hazard, better finish because of use of heated materials—*Bede Products Corp, Amherst, Ohio*

Oakite Barrel-Finishing Compounds Treat Variety of Materials

Three compounds added to company line of barrel-finishing materials are designed for use in many metal-treating operations: FM-183 is an alkaline compound designed for the deburring of steel, stainless steel, and zinc die castings. FM-184 is an acidic compound for deburring, removing heat scale, and brightening steel, stainless steel, copper, and brass parts. FM-186, an alkaline product, produces bright finish and color on zinc die castings.

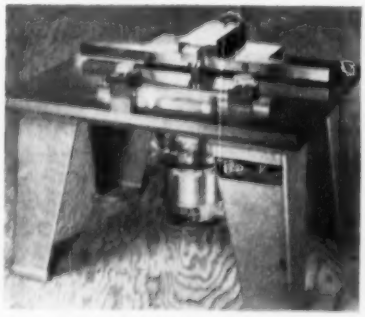
Oakite Products, Inc, 19 Rector St, New York 6, NY

Thomson Flash Welder Trims Flash Extrusion as It Welds

Flash welder called Synchro-Shear eliminates need for separate flash-trimming operation by trimming the flash extrusion as it makes the weld. Machine will handle carbon steel (from mild to 1.00 carbon), high-speed steel, high-alloy steel, and stainless steel. It will weld and trim all shapes normally encountered in flash welding, including flats, squares, rectangles, rounds, and most irregular or extruded shapes. It delivers product ready for use; in most cases, according to maker, no further post-weld cleanup is necessary.

Shearing action is an integral part of the welding cycle and follows immediately after the upset motion. Welders are available in a complete range of standard sizes, can handle all products in the size range now welded in conventional flash welders.

Thomson Electric Welder Co, 161 Pleasant St, Lynn, Mass



TENSILE TEST SPECIMENS can be machined on portable Tensilkut II. Specimens 0.0005 to 0.500 in. in thickness can reportedly be machined from ferrous and non-ferrous metals and plastics in less than 3 min. Excellent results are said to be obtained on light-gage titanium and super alloys to 0.062 in. Model produces undistorted edges with no measurable amount of cold working and with no evolution of heat. Precision master templet controls specimen tolerances to accuracy of ±0.0005 in. Templets and cutters are available for unit—*Sieburg Industries, Inc, Horse Plain Rd, New Britain, Conn*

Metal Show | in print

PAINT-SPRAY GUN, designated T-100, is available for use with all of company's airless spray coating systems. Tool incorporates snap-action mechanism which opens and closes the needle mechanically in a few hundredths of a second, eliminating gun spitting. Needles and needle seats are tipped with tungsten carbide; insulated gun body is of reinforced plastic design. Other features: swivel hose connections, micrometer fluid control, frictionless needle-actuating mechanism which eliminates need for needle packing—*Bede Products Corp, Amherst, Ohio*

Wheelco Indicating Controllers Adapt to Many Processes

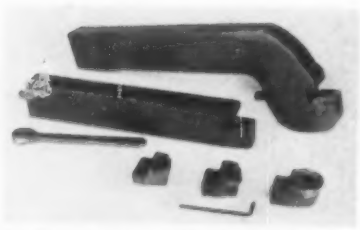
Series 400 Capacitrol, offered in several types, is a self-contained indicating controller adaptable to a multitude of process applications, such as furnaces, ovens, glass and ceramics kilns, plastics extruders, and process machinery where voltage, current, or speed must be closely controlled.

Model 402 known as Truline, is an "anticipatory" time-proportioning controller used in applications where compensation for system inertia is necessary. It incorporates a time-constant network which shifts the control point in the electronic circuit to adjust electronically the true control point to meet actual system requirements.

Model 405, a proportional position controller, is intended for continuous-process applications which require a true proportional relationship between fuel input and a continuously measured temperature.

Model 407, a "stepless" controller which proportions electrical input to furnaces and similar units, is used for the control of saturable core reactors.

Barber-Colman Co, Wheelco Instruments Div, Rockford, Ill

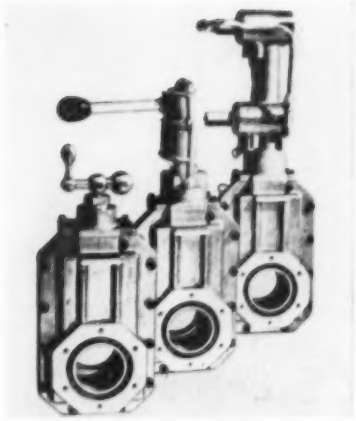


CARBIDE-TIP TOOLHOLDER uses special 2-in.-dia Carboloy 370 carbide button. Straight, rear-lock holder permits fast tool indexing without its being removed from planer clapper box. Other-shape toolbits, either with carbide tips or high-speed steel tips, can be changed in holder while it is in the machine—*Apex Tool & Cutter Co, Shelton, Conn*

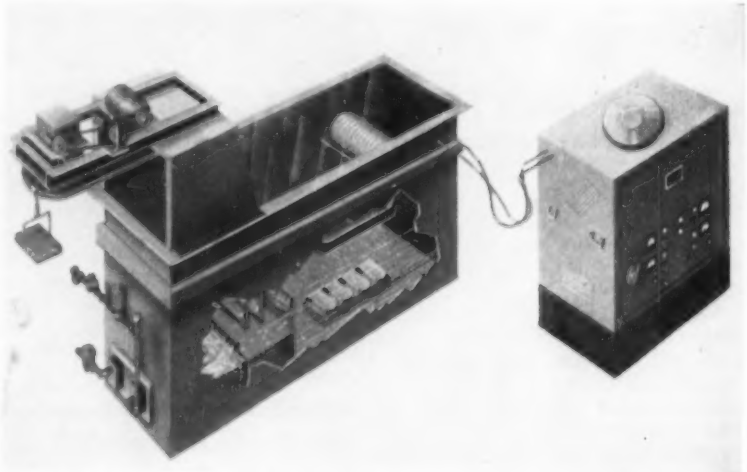
Tempil Sticks Indicate Specific Temperatures

Designed to indicate temperatures of industrial heating equipment or to be used in connection with various metalworking operations, temperature sticks called Tempilstiks have been developed for 525 F and 575 F, and are addition to company's line for various other temperatures. Company also offers temperature indicators in liquid form (Tempilaq), as well as pellet form.

Tempil Corp, 132 W 22nd St, New York 11, NY



STRAIGHT-THROUGH GATE VALVES in STV Series are available in nominal diameters of 2, 4, and 6 in., with three types of actuation—throttling manual, quick-acting manual, and pneumatic. Body and valve plate are cast aluminum, working parts are steel. Valve plate is guided by rollers and connected to a follower carriage through two hinged links; this mechanism prevents scuffing of gasket when valve plate is opened and closed. Valve will seal vacuum-tight in either direction against atmospheric pressure and may be actuated in either condition. Flow path is unrestricted—*Consolidated Vacuum Div of Consolidated Electrodynamics Corp, Rochester 3, NY*



ULTRASONIC DEGREASER called Soniclean is shown in cutaway view coupled to a Model 2500 generator. Self-contained machine features a monorail conveyor. Following a solvent vapor-spray-vapor cleaning cycle, work is immersed in an ultrasonically agitated trichorethylene bath, which is kept clean by continuous distillation and filtration. After this action, work receives a final rinse of pure solvent distillate and is dried in the solvent vapor—*Detrex Chemical Industries, Inc, PO Box 501, Detroit 32, Mich*

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 16-IN. HEAVY-DUTY ENGINE LATHE AND PLAIN BED GAP LATHE—*K K LeBlond Machine Tool Co, Cincinnati 8, Ohio.* 16-page illustrated bulletin HD-127 describes features including new headstock which gives speeds up to 2000 rpm. Specifications detailed; standard and extra equipment covered.

2 RED-E CENTERS—*Ready Tool Co, 554 Iranistan Ave, Bridgeport 5, Conn.* 16-page catalog CD-56 contains illustrated descriptions of centers for cylindrical grinding machines and lathes, and grinder dogs. Includes data on several new centers, as well as a grinding machine chart for correct selection of taper specifications, master chart for center hole design, price list and specifications.

3 DUAL-RAM BROACHING MACHINES—*Colonial Broach & Machine Co, PO Box 37, Harper Station, Detroit 13, Mich.* 4-page illustrated bulletin MVT-56 gives operating characteristics and capacities of ElectroGear Model MVT. Design features, details on ram speeds, stroke lengths, dimensions given for 10 machines in the line.

4 AIR-POWERED PRESSES — *Van Products Co, 5700 Old Ridge Rd, Erie 7, Penna.* 4-page catalog describes expanded line of Vi-Speed units including 8 bench-type models, 16 new air arbor presses, and 8 models of small platen-type design. Units range from 1 to 5 tons at 100 psig.

5 PRECISION SPINDLES—*Standard Electrical Tool Co, 2488-96 River Rd, Cincinnati 4, Ohio.* 45-page catalog 20 contains engineering information, dimensions, selection data on spindles for grinding, boring, drilling, milling, routing. Also covers work heads, machine tool attachments including worktable and slides for horizontal and vertical mounting.

6 SWAGING EQUIPMENT — *Fenn Manufacturing Co, Fenn Rd, Newington, Conn.* 16-page catalog SM56 illustrates complete line; describes features and gives specifications of machines. Includes technical data on rotary swaging process and principles of operation; applications pictured.

7 AUTOMATIC DIAL FEED MULTI-SPINDLE MACHINES — *Bodine Corp, Bridgeport 5, Conn.* 33-page illustrated case history book gives quick-reference tooling and production details on 14 different types of work produced on Bodine basic machines, with various combinations of standard tooling methods and units.

8 MILLING MACHINE — *US Burke Machine Tool Division, Brotherton Rd, Cincinnati 27, Ohio.* 4-page booklet contains illustrated description of the Quartet, a turret-type unit capable of horizontal, vertical, angular, and universal milling operations. Gives advantages, operational principle, specifications.

TOOLS AND ACCESSORIES

9 "HANDBOOK ON TOOL ROOM GRINDING"—*Norton Co, Worcester 6, Mass.* 222-page illustrated booklet (Form 781) covers general tool grinding, sharpening of HSS, non-ferrous cast alloy, and carbide tools. Machines described; tables of information include grinding wheel recommendations, grinding wheel speeds, classification and composition of principal types of tool steels.

10 MANUALLY OPERATED CHUCKS —*Cushman Chuck Co, Hartford 2, Conn.* 91-page illustrated catalog 66-1956 is a spiral-bound engineering manual containing detailed drawings and dimensions of complete line; simplified method of listing for quick selection; includes details on new series of airtight chucks, and special purpose units.

11 SPECIAL CUTTING TOOLS—*O K Tool Co, Inc, Milford, NH.* 50-page booklet contains series of detailed drawings of special cutting tools.

12 CARBIDE BLANKS—*Beely-Welles Corp, 851 Dearborn Ave, S Beloit, Ill.* 12-page catalog 851C illustrates and describes complete line; includes prices, sizes, styles, and shapes.

13 SPRAY LUBRICATION EQUIPMENT—*Farval Corp, 3249 E 80th St, Cleveland 4, Ohio.* 8-page bulletin 60-A covers lubrication systems for open gearing and slide surfaces. Manual and automatic systems pictured and described; engineering data and applications included.

Name .....
Title .....
Company .....
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AMERICAN MACHINIST, 9-24-56 *Not good after Nov. 24, 1956*

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14 DIRECT READING ELECTRONIC MICROMETERS — *J W Dice Co, Englewood, NJ.* 4-page bulletin 4003 contains illustrated descriptions of four hand-operated units for direct, pressureless measurements to 20 millionths of an inch. Principle of operation, specifications and applications described.

15 CARBIDE TOOLS—*Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill.* 16-page catalog illustrates complete line, gives technical data.

HEAT TREATING AND WELDING

16 WELDING EQUIPMENT — *Modern Engineering Co, 3407 Pine Blvd, St Louis 3, Mo.* 1956 revised No. 150 general welding catalog covers complete line of oxyacetylene welding and cutting torches, machine cutting torches, regulators, pressure gages, hose connections, couplings, and safety equipment.

17 FURNACE AND OVEN CONTROLS — *Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Penna.* 46-page condensed catalog and price list B43-1 gives illustrated information on new ElectroniK Special Class 14 line of strip chart, circular chart, and circular scale instruments. Includes specifications and prices of vane-type millivoltmeter controllers, thermocouples, Radiamatic radiation detectors, and others.

18 MAGNETIC FORCE WELDERS—*Precision Welder & Flexopress Corp, 2520 Ibsen Ave, Cincinnati 9, Ohio.* 6-page illustrated bulletin MF-100 describes advantages of magnetic force welding for joining difficult-to-weld critical materials. Machine features, controls, and adjustments pictured and discussed.

PLANT SERVICE EQUIPMENT

19 VAPOR DEGREASING — *Circo Equipment Co, 51 Terminal Ave, Clark (Rahway), NJ.* 24-page illustrated manual describes use, operation, and maintenance of all types of equipment including straight vapor, vapor and liquid, and special systems embodying vapor phases. Special section covers solvents, service, metal washing equipment, and ultrasonics.

20 MATERIAL HANDLING EQUIPMENT—*Mercury Manufacturing Co, 4044 S Halsted St, Chicago 9, Ill.* 52-page catalog 400 contains specifications and illustrations of entire line of current model fork lift, platform lift, and load carrying trucks, industrial tractors and trailers.

21 PROTECTIVE COATINGS — *US Stoneware Co, Plastics & Synthetics Div, Akron 9, Ohio.* 29-page bulletin 760 discusses line of Tygon coatings and related primers; includes surface preparation, priming, application methods, and maintenance instructions. Table of chemical resistance gives resistance rating of each coating to over 200 corrosive agents.

22 ELECTRIC FORK TRUCK—*Lewis-Shepard Products, Inc, Watertown, Mass.* 20-page illustrated catalog 32-1 describes new 1957 Spacemaster Model E. Features include heavier mast, faster lift speeds, improved floating brakes and steering. Engineering data, maintenance, advantages, applications, and attachments covered.

23 OVERHEAD MATERIALS HANDLING SYSTEMS—*Cleveland Crane & Engineering Co, Tramrail Div, 1046 E 259th St, Wickliffe, Ohio.* 12-page revised edition of engineering and application booklet 2008-M illustrates and describes principal components of systems. Discusses carriers for hand, electric, and automatic operation; tractors; track switches; standard, transfer, and gantry cranes; safety electrification; buckets and grabs.

PARTS AND MATERIALS

24 PRECISION BEARINGS — *McGill Manufacturing Co, Bearing Div, Valparaiso, Ind.* 128-page catalog 52-A gives specifications and dimensions for each type and size in the line including Camrol, Multirol, and Guiderol. Engineering section lists formulas and data for use in determining numerical values for various loads to which bearings are subjected. Selection factors, applications, new models.

● HYDRAULIC VALVES — *Commercial Shearing & Stamping Co, 1775 Logan Ave, Youngstown 1, Ohio.* 92-page catalog H-12 contains detailed information on oil hydraulic valves for controlling fluid power when used to control operation of cylinders and motors. Performance data, capacities, types, sizes, mounting dimensions; typical installations illustrated. Request direct on company letterhead.

● ALCOA ALUMINUM HANDBOOK —*Aluminum Company of America, 781 Alcoa Bldg, Pittsburgh 19, Penna.* 176-page book contains data on aluminum alloys and mill products in tabular form. Sections on wrought and casting alloys contain typical mechanical, tensile, and chemical properties, characteristics and applications; sections on mill products discuss sizes, properties, and tolerances. Code numbering system used to designate alloys and their modifications explained. Request direct on company letterhead.

25 THERMISTORS — *Fenwal Electronics Inc, 61 Mellen St, Framingham, Mass.* 12-page catalog EMC-1 contains dimensional drawings, physical descriptions, and electrical specifications for various forms, including beads, rods, disks, washers, and built-up assemblies. Applications illustrated.

26 MOTOR DRIVES — *Worthington Corp, Harrison, NJ.* 8-page booklet gives illustrated descriptions of units with positive pulley adjustment, ranging from ½ to 25 hp, equipped with mounted handwheel for fingertip speed control; can be mounted on floor, wall, or ceiling.

27 BONDABLE TEFLON, RULON — *Dixon Corp, Bristol, RI.* Set of three pieces of literature describes method of surface-treating that permits firm bonding to metals, wood, plastics, web belts. Company is presently imparting bondability to tape or film, rods, sheets, and extruded or molded shapes. Tape thickness and widths tabulated.

28 HIGH-TEMP ALLOY—*Haynes Stellite Co, 30-20 Thomson Ave, Long Island City 1, NY.* 12-page booklet gives data on Hastelloy alloy R-235, a wrought, nickel-base, aluminum- and titanium-bearing, precipitation-hardening product said to have outstanding properties through 1750 F. Chemical composition, physical, mechanical and high-temp properties described.

Continued on page 226

Talking About Die Sets

with
Phil Marsilius
Vice-President
The Producto Machine Co.

Master or Commercial: What Makes the Difference? The most obvious difference between a Master (Precision) set and a Commercial set is the price. The Commercial set costs less because less assembly time is required in its manufacture. Punch holder and die holder tolerances are the same for both grades of die set. However, extremely close tolerances for fit between pins and bushings on Master sets require more accurate honing of bushings in assembly. Master die set tolerances for parallelism between punch and die holder are also more critical than those for Commercial die sets.

Normally, the difference between pin and bushing diameters on die sets manufactured by our industry is never less than .0002" and ranges as high as .0009". There are die sets made to closer or looser tolerances than these, but generally speaking, the majority of die sets fall into this category.

Master die sets are manufactured to the low side of this tolerance scale and are held to a maximum of .0004" differential. This closer tolerance increases the useful life of precision sets by allowing for wearing of the pins and bushings in operation.

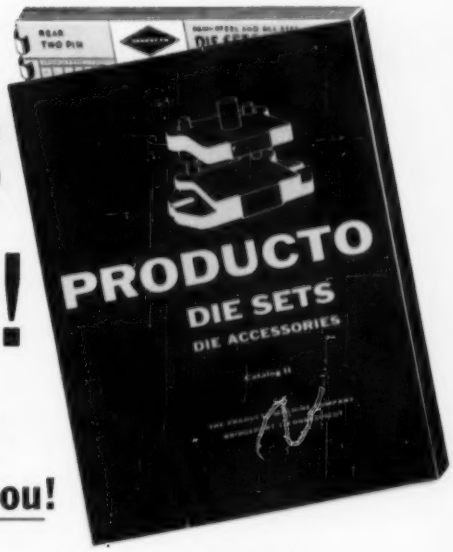
Commercial die sets are made throughout the entire range of this tolerance scale and, more often than not (to reduce assembly cost), are made to the higher tolerances. As a result, their accuracy will usually decrease much faster than that of Master die sets. While it is possible with this tolerance range to receive a Commercial set with the minimum pin and bushing fit allowed, you can be certain of longer die set accuracy only with a Master set, which is guaranteed to be held to the low side.

A "free-sliding fit" is one that permits the punch holder to move down on the guide pins of its own weight. It does not have any bearing on the degree of accuracy of the die set since a free-sliding fit can be supplied on both Master and Commercial sets. On Master sets, however, it is sometimes necessary to hone out the bushings to a full .0004" tolerance to provide a free-sliding fit.

EVERY die set MUST, of necessity, work freely in normal use, *on the press,* but catalog die sets should come apart and go together easily for bench work. With an occasional exception (when sets are made to the lowest tolerance for fit allowed), disassembly should be possible by hand without use of separating tools.

In making a choice, the degree of accuracy required and the life requirements of the die set should be the main points of consideration which determine whether you should order a Master or Commercial die set.

IT'S HERE!



A new catalog designed for you!

WRITE FOR YOUR COPY TODAY

Here, at last, is a die set catalog that makes your selection and ordering really easy. Producto's all-new catalog is compact for the die designer, convenient for the purchasing agent, a functional tool for the die maker.

These unique features make Producto's catalog much easier for you to use:

IT'S COMPACT. Though many items have been added, it has *fewer* pages because superfluous material has been eliminated. New products include Qwik-Fit Guide Pins, new Bushings with grease fittings, Lamina Bushings, Ring Punches and Dies, Toolroom Equipment, Lubrication Accessories and new Die Spring Selections.

IT'S COMPLETE, containing the greatest selection of die sets and accessories that has ever been offered to date.

ALL PRICES ARE NET and appear in a *separate pricing supplement,* removed from the technical section. No more time-consuming "discount" calculations.

NEW BINDING ARRANGEMENT lets you look at technical and pricing information *simultaneously.* No more flipping pages back and forth to get complete information.

STREAMLINED PAGE LAYOUT makes it easier for you to find essential data. Color highlights catalog numbers and drawings.

To make your die set ordering as painless as possible, write today for a free copy of Producto's new Catalog No. 11.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used
PRODUCTO
PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

Metal Show | in print

Wilson Hardness Tester Motorized to Reduce Load

Model Y Rockwell hardness tester is a semi-automatic, high-capacity unit which features a short test cycle to permit taking relatively large number of Rockwell readings within a short period. Instrument has an illuminated dial gage, indenter light, and company's Set-O-Matic dial gage, which returns indicator pointer automatically to zero when a minor load is applied.

Motor's function in the test cycle is to remove the major load. Cycle of major-load operation may be adjusted to less than two seconds, and application is controlled through a dash-pot which gives variable speed control if desired. Power is supplied from a 110-v, 60-c ac line.

Wilson Mechanical Instrument Div, American Chain & Cable Co, Bridgeport, Conn

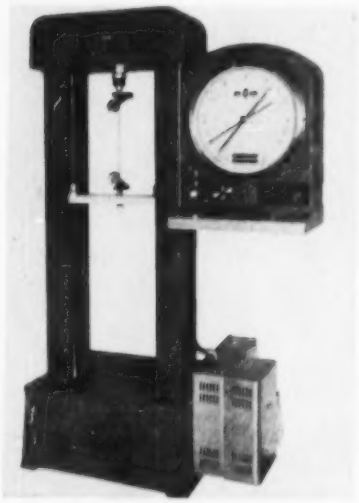
X-Ray Instrument Measures Metal Coatings to 0.000001 in.

Designed to fill need for gaging or continuous analytical control where a single-element determination is important, X-ray fluorescence instrument permits continuous determination of the thickness of a metal coating to millionth of an inch. Primary components consist of X-ray head, a self-contained assembly including X-ray tube and two detector heads; high-voltage source, a cased unit mounted next to the line; and a ratio recorder, comprising a strip chart recorder, ratio amplifier, and high-voltage Geiger supply.

Ratio recorder reads the direct ratios of one current signal to another obtained from the Geigers of the two detector heads, one measuring for the element to be determined, the other a standard reference signal. Time constant of the ratio circuit is adjustable to suit the problem; in continuous measurement, time constant can be set to provide an average value for the material being measured.

Instrumentation makes possible the non-destructive analysis of metals, powders, or liquids for a single element directly on the production line.

Applied Research Laboratories, PO Box 1710, Glendale 5, Calif



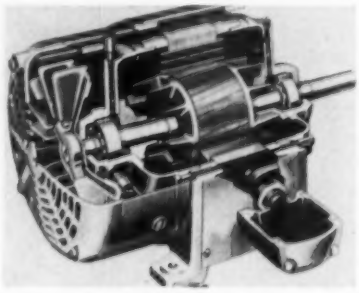
LOW-CAPACITY TESTING MACHINE, called Lo-Cap Electomatic, is designed for tension, compression, flexure, or universal testing. Machine performs testing functions in capacities to 1000 lb. Load is indicated on a 15-in.-dia dial mounted on top of machine. Either of two capacity ranges, full and 1/5 or ¼ capacity, is available at flip of switch. Speed range is variable from 0.3 to 12 ipm, can be furnished in other 40-to-1 ratios. Compact unit occupies 5 sq ft, can be used for on-the-spot tests on production lines—*Tinius Olsen Testing Machine Co, Willow Grove, Penna*

Park Chemical Additive Is Base For Blended Cutting Oil

Kem-Ad, a concentrated solution of chemical additives in a paraffin-oil base, can be easily blended with neutral oils to produce high-quality cutting oils, or added to used cutting oils to improve tool life and finish. Cutting compounds can be produced by mixing Kem-Ad with oils ranging in viscosity from 100 ss at 100 F to 160 ss at 100 F. Lubricating, quenching, hydraulic, and reclaimed oils can be used as a blending medium. No heat is required, and ordinary pumping action will yield a uniform product. One part of Kem-Ad to 8 or 10 parts of blending oil is recommended.

For used cutting oils, product can be added directly to the machine at a ratio of one to ten or 15 parts of oil.

Park Chemical Co, 8074 Military Ave, Detroit 4, Mich



TOTALLY-ENCLOSED MOTOR designated Types SD and SE Chemical Motor, designed for dangerous and damaging atmospheres, is corrosion protected. For these services, unit incorporates stainless-steel fan cover guard; stainless-steel stator band surrounding inner enclosed case; cast-iron conduit box sealed with a non-deteriorating, impervious compound; cast-iron ventilating fan for totally enclosed design or cast bronze fan for explosion-proof service. Motor is produced in ratings from 3 to 150 hp. Bulletin 1810—*U S Electrical Motors, Inc, Box 2058, Los Angeles 54, Calif*

Park Grinding Compound Provides Rust Protection

Combination of alkaline detergents and chemical rust inhibitors, designated Blue Ice, is engineered for light machining and general-purpose grinding use. Product is said to function effectively at dilutions of from 40-to-1 up to 200-to-1. It can be used on all common metals and alloys, and is harmless to machines and machine parts.

Excellent rustproofing is reportedly provided at all dilutions by the light-blue solution, which remains stable indefinitely and will not become rancid. Product is not recommended for use in form grinding and heavy machining operations.

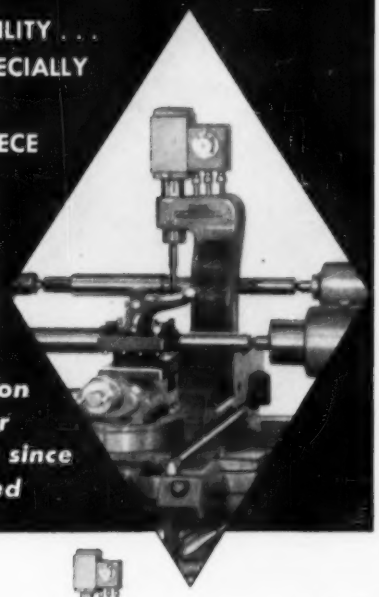
Park Chemical Co, 8074 Military Ave, Detroit 4, Mich

Truly Sensational!!

IN SIMPLICITY . . . VERSATILITY . . .
PRECISION-ACCURACY . . . ESPECIALLY
IN SAVINGS IN COST
PER FINISHED PIECE

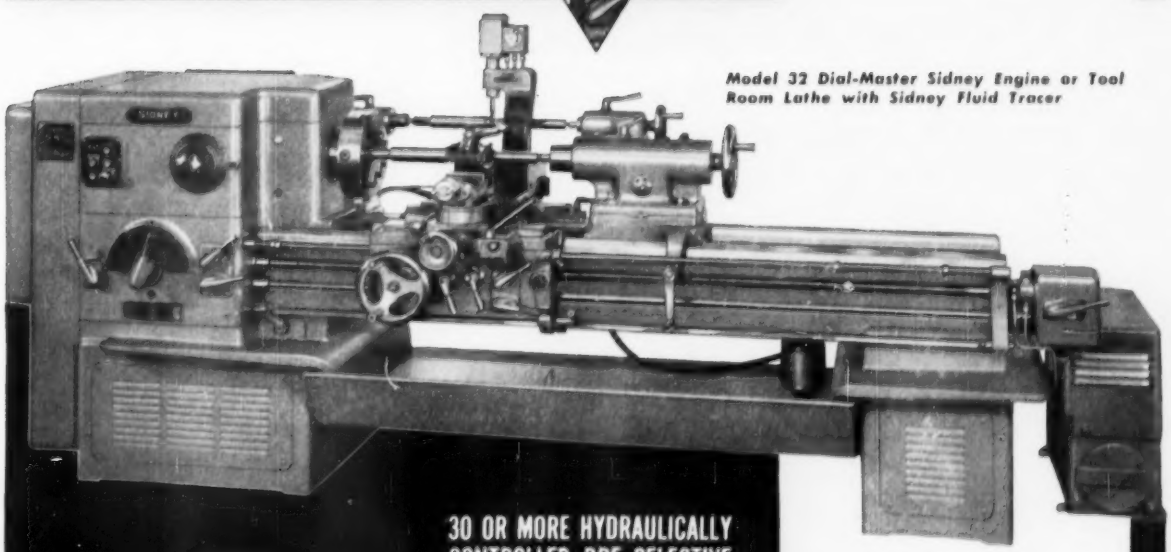
SIDNEY
FLUID TRACER

The finest precision duplicating attachment ever offered to industry since cutting tools were invented



INSTANTLY . . . precisely and in any desired quantity (no matter how small or extended a run) every change in contour is transferred from master piece or template to the cutting tool. It also controls the hydraulically actuated cross feed and the longitudinal movement of the carriage.

Changeover to standard lathe operation or back to tracer work requires only a few seconds without the addition or removal of any parts.



Model 32 Dial-Master Sidney Engine or Tool Room Lathe with Sidney Fluid Tracer

THE SIDNEY MACHINE TOOL COMPANY
over 50 years
of service to
AMERICAN INDUSTRY
SIDNEY • OHIO

30 OR MORE HYDRAULICALLY CONTROLLED PRE-SELECTIVE SPINDLE SPEEDS

A revolutionary innovation and presented as a "SIDNEY FIRST" as long ago as the Machine Tool Show of 1947 . . . used regularly as a standard SIDNEY feature ever since. But only recently adapted by other lathe manufacturers . . . a fitting tribute to SIDNEY pioneering and leadership.

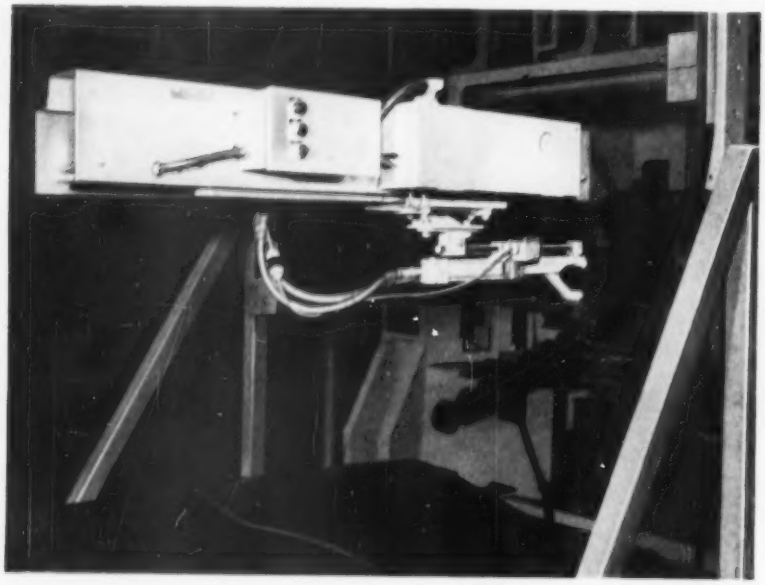
THE SIDNEY FLUID TRACER is remarkable! It saves time and costs and increases production.

Write for bulletin or ask for representative to call at your convenience.

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904

New Shop Equipment



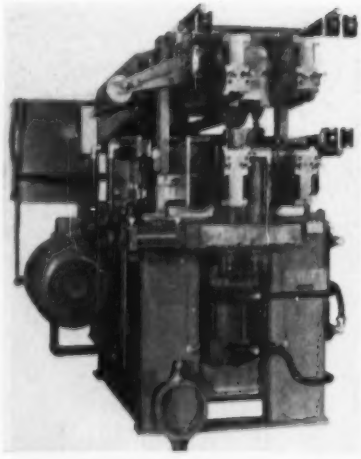
Straight-Line Press Unloader Adapts to All Types of Presses

Air-powered press unloader designated PAS is a self-contained package that unloads sheet-metal panels or forgings from presses in a straight line. Plug-in connections to standard air and 110-v electrical controls put the unit in operation. Unloader operates on 50 psi air pressure. It is supported by portable or fixed-frame mountings which can be made by company to customer specifications. Installed on a press, it requires no guards, provides easy access for die setting, does not interfere with crane chains, and will unload draw dies on the binder angle.

Speed and stroke adjustments as well as dimensional adjustments can be made from floor level. Interchangeable jaw assemblies and vertical-lift attachments can be provided.

In operation, jaws in the jaw assembly, which is bolted adjustably to a carriage, advance into the die area and grip the sheet-metal panel. Carriage moves to rear, jaws open and retract, and panel is released. Carriage then advances to start position for unloading of next panel. Unloaders come in four models, with varying adjustable strokes.

Press Automation Systems, Inc, 18616 Wyoming Ave, Detroit 21, Mich

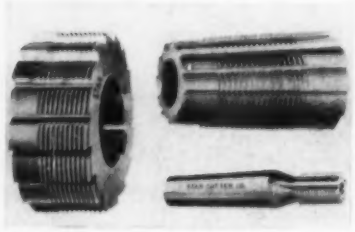


Hydraulic Flash Trimmer Employs Broach to Remove Excess Metal

Powered by a rotary-vane hydraulic pump, flash trimmer employs broaching for high-production removal of excess metal. Machine, which will trim a number of faces in various planes, is reported particularly adaptable to parts requiring machining after welding.

Work is placed in a hydraulic positioning clamp, then automatically faced by 8 broaches and 4 single-tooth cutters. Broaching is a draw-cut operation. Broaching and trimming operations are hydraulically actuated.

Swift Electric Welder Co, 8095 Livernois, Detroit 4, Mich



Star Milling Cutters Have Gear Hob Precision

Line of multiple-thread milling cutters is made with a precision heat-treating process that is reported to provide tools with unground-form gear hob precision. Called Star-Process Cutters, they are made from HSS forged blanks on which the teeth are formed with master form tools in a three-step production operation prior to heat-treating. Precision maintained in heat-treating permits only faces of teeth and mounting surfaces to be ground after heat treatment.

Process reportedly produces cutters which cost up to 40% less than cutters made to commercial ground tolerances. Tools are made in both shank- and shell-type designs, with a variety of thread forms to customer specifications.

Star Cutter Co, 34500 Grand River Ave, Farmington, Mich

Lighter Rotary Air Pumps Replace Older Gast Models

Three rotary air pumps of integral-motor design offer average weight reductions of 1/3 over former models. All models have rotor mounted directly on the shaft of GE Form G motors.

Model 0211 with 1/6-hp motor weighs 22 lb, delivers up to 1.3 cfm of free air at 1750 rpm. Model 0321 delivers up to 2.2 cfm with ¼-hp motor. Model 0521 delivers 3.8 cfm with 1/3 hp. Bulletin VP-356-4.

Gast Mfg Corp, Benton Harbor, Mich

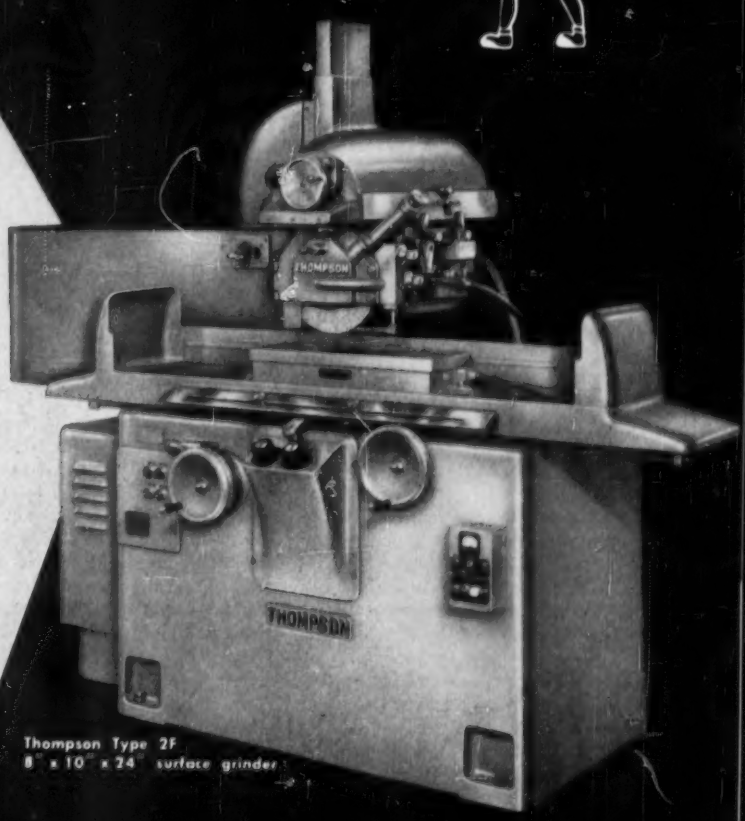
PRECISION PETE SAYS:

Only Thompson Type 2F Grinder has all three available . . .

1 COOLANT THRU THE WHEEL . . .

2 . . . COOLANT EXTERNALLY ON THE WORK . . .

3 . . . AND "IN POSITION" WHEEL TRUING



Thompson Type 2F
8" x 10" x 24" surface grinder

MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SURFACE GRINDERS

WRITE TODAY FOR DESCRIPTIVE DATA

THE THOMPSON GRINDER COMPANY
SPRINGFIELD, OHIO

Thompson SURFACE Grinders

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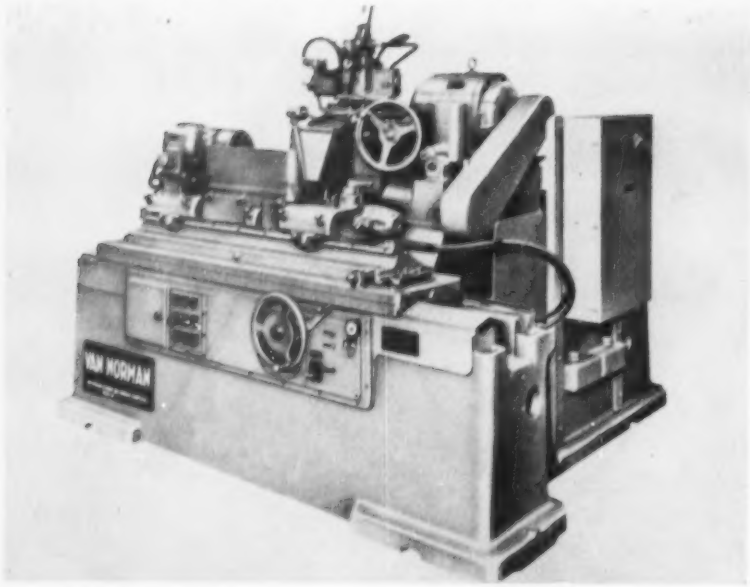


Van Norman Production Grinder Features Automatic Wheelhead Unit

Model 4BG1 single-head, plunge-cut production grinder features company's Bowgage wheelhead unit, an automatic integral grinding assembly with gaging, rough- and finish-feeds, and automatic cycle with rapid traverse. Operator loads work, pushes start button, and machine takes over, performing all operations; machine then stops automatically for removal and reloading of work.

Machine is available in two sizes—10 x 24 in. and 10 x 36 in. Maximum swing over table is 10 in., maximum diameter of grind is 6 in., and maximum distance between centers is 28½ in. Headstock speed range of 50 to 600 rpm is provided by motor of ½ to 1½ hp. Wheelhead motor size of 7½ to 10 hp gives spindle speeds of 830 rpm.

Other specifications: automatic wheel heads, 0 to 0.063 in.; rapid traverse, 0 to 5 in.; dwell or spark-out time, 0 to 5 min; angular positioning of wheelhead to 30°.

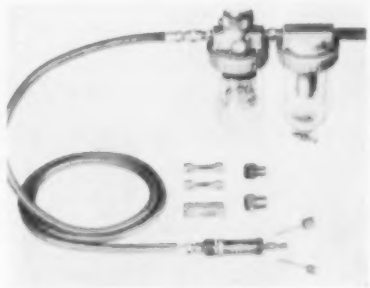
Van Norman Machine Co, Springfield 7, Mass

Electric Power Tool Has Automatic Torque Control

Size 5UT Impactool is addition to series of power tools designed to run down fastenings with great speed and power to a preset torque (*AM*—Jan 30 '56, p132). Torsion bar used with tool is set by holding bar in a vise and using a wrench to turn the bar to the desired torque on a calibrated sleeve. Two torsion bars are available, giving a torque range of from 20 to 90 ft-lb. Torque setting remains constant for any nut-running operation until the adjustment is changed. If specific torque is not desired, turning a selector knob to the "Off" position will enable tool to be used conventionally.

Model has a ½-in. square drive and takes bolt sizes up to ⅝-in. diameter. Tool weighs 6½ lb, has overall length of 10¼ in. (less torsion bar). It has an approximate free speed (forward or reverse) of 1900 rpm and delivers 1900 impacts per min.

Ingersoll-Rand Co, 11 Broadway, New York 4, NY

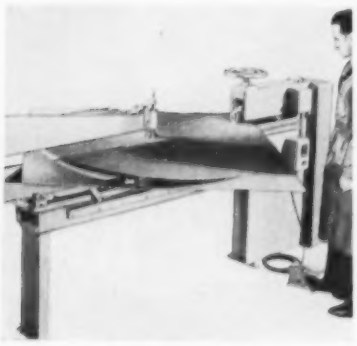


Buckeye Miniature Grinder Weighs Only 3½ oz

High-speed, vane-type grinder not much larger than an ordinary fountain pen, called Mini-Grinder, is 3¾-in. long, weighs 3½ oz. Rated capacity is ½-in. mounted point or grinding wheel. Tool has ⅛-in. precision-ground collet.

Rotary valve in the all-steel tool provides infinite speed control from 0 to 50,000 rpm. Grinder is available in a complete kit, which includes grinder, 3 nosepieces, 3 mounted points, 2 collet wrenches, dressing stone, 5 ft of air hose and couplings, and fog-type lubricator-filter.

Buckeye Tool Corp, Div 4, PO Box 966, Dayton 1, Ohio



Niagara Ring and Circle Shear Has Floating Circle Arm

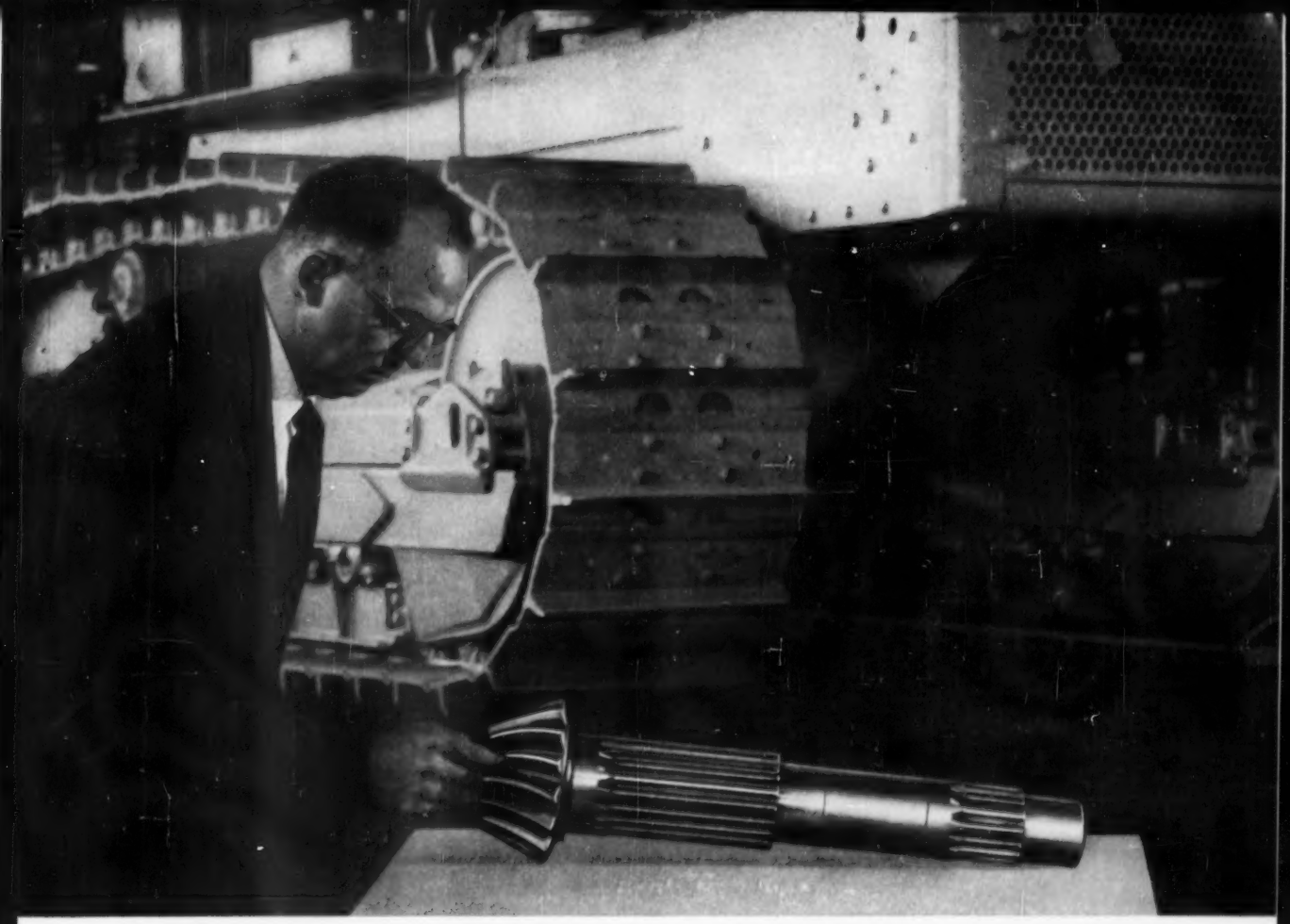
Model 31-RC incorporates self-compensating circle arm which floats on guided ways to maintain true center automatically.

Adjustable crank enables quick positioning of arm for cutting circles of various diameters. Actuated by cam lever, center clamp of arm can be adjusted to hold varying thicknesses of material securely. Unit can be used for cutting both straight line work and irregular outlines, not requiring sharp curvatures, as well as for cutting circles, circular holes and rings. With capacity of 10-gage mild steel, it cuts circles from 6 through 78 in. in diameter. Hand wheel raises and lowers upper cutter, permitting operation to be started at any point on the blank. Details in bulletin 70 supplement.

Niagara Machine & Tool Works, 633 Northland Ave, Buffalo 11, NY

Cleaning solvent named Immunol is a neutral, non-toxic, non-flammable solvent that cleans, degreases, and rustproofs all metal surfaces in one operation. Mixed with water, it can be used in a wide variety of operations.

Harry Miller Corp, 4th & Bristol Sts, Philadelphia 40, Penna



Caterpillar Tractor Co. Metallurgist T. H. Spencer inspects final drive pinion for D9 crawler tractor weighing 28 tons. Severe loading of this large pinion requires a steel with high case and core hardenability. Several years ago Caterpillar Tractor Co. found that simply by increasing the molybdenum content of AISI 8622 (to 0.30-0.40%), the desired properties were obtained at lower cost than was possible in any of the standard carburizing grades.

Caterpillar Tractor Co. improves case and core hardenability of carburizing steel by increasing molybdenum content

"Drive pinions in tractors must take very high torque loads," says T. H. Spencer, Metallurgist for Caterpillar Tractor Co. "AISI 8622 steel, which we had been using, couldn't give us the hard case and strong, tough core we needed in these heavy sections. Other standard carburizing steels with the requisite properties would have cost substantially more. We found, however, that we could achieve the desired surface and core properties by simply modifying AISI 8622 with a higher percentage of molybdenum. We have been using this composition for several years, and results have been excellent."

Caterpillar Tractor Co.'s experience shows how increasing molybdenum in a carburizing steel helped to solve a specific problem. Perhaps your product, too, can benefit by higher molybdenum content.

A technical article, "New Carburizing Steels for Critical Gearing", describes some recent investigations of higher-moly carburizing steels. For a reprint, write Climax Molybdenum Company, Dept. 12, 500 Fifth Avenue, New York 36, N. Y.

CLIMAX MOLYBDENUM

Lindberg Ladling Unit Handles Molten Aluminum Automatically

Made of high-grade special refractory materials, automatic ladling unit for aluminum is so arranged that the molten metal being ladled cannot come in contact with any metal structure. Basic pump has no moving parts, check valves, or other devices. Unit operates on principle of a pressurized chamber, size of shot depending both on time of pressure application and on the pressure. Ladled metal is withdrawn from beneath surface of the bath.

There is a wide latitude in the ladling range, and it can be adjusted to vary shot size. Equipment is normally supplied to cover range of 1 to 10 lb of aluminum, but other sizes can be furnished. Complete system consists of one ladling unit, ready for immersion in molten metal; one control cubicle completely assembled; and one pressure blower. Operating voltage is 220 to 440 v.

Lindberg-Fisher Div, Lindberg Engineering Co, 2450 W Hubbard St, Chicago 12, Ill

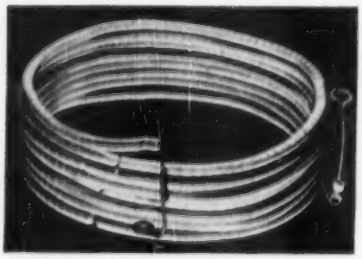
G E Engine-Driven Welder In 300- and 400-amp Models

Engine-driven welder with battery start and direct coupling between engine and generator is constructed of extra-heavy steel, has no projecting controls or generator that could be damaged in on-the-job operation. Available in 300- and 400-amp models, welder includes reversing switch and side panels as standard equipment.

Both 2- and 4-wheel trailers are available to meet handling requirements. Gasoline-driven models are equipped with Hercules JX4 engines, rated 54 hp at 2150 rpm. Both models have a duty cycle of 60%, rated temperature rise of 50 C, open-circuit voltage of 80, and operate at maximum rpm of 2150.

300-amp unit, designated 30AG, has welding range of 60 to 375 amp and electrode capacity of 3/32 to 5/16 in. 400-amp machine, Model 40AG, has operating range of 80 to 500 amp, electrode capacity of ⅛ to ⅜ in.

General Electric Co, Schenectady 5, NY



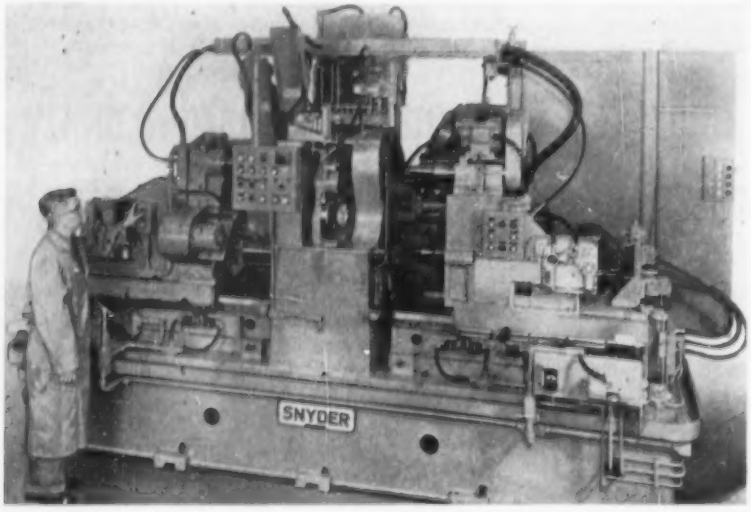
Resistance Heating Element Simplifies Pipe-Weld Heating

Resistance heating element called Heat-O-Coil is said to make preheating or stress-relieving pipe welds easier. Unit consists of a length of small-diameter resistance wire strung with ceramic ball and socket heads. Each end of coil, uncovered, is formed into a small ring. After coil is wrapped around welded section of pipe for stress-relieving, the two ends are connected to welding-machine terminals.

Thermocouples are inserted under coil and connected to indicating pyrometer, then section being treated is wrapped with asbestos. Welding generator is now set at amperage rate calculated to produce necessary heat. Pyrometer indicates when desired temperature is reached, then generator is adjusted manually to hold correct temperature.

Elements are available in 25-ft lengths for ⅛-in. coil and 10-ft lengths for 1/16-in. coil. Special lengths are available on order.

Arcos Corp, 1500 S 50th St, Philadelphia 43, Penna



ELECTRIC-MOTOR PARTS are both machined and assembled on six-station trunnion-type precision boring machine, which faces, bores, and chamfers holes in 5 11/16-in.-dia die-cast end shields and assembles a bushing in the center-hole. Production rate is 350 per hr at 75% efficiency. Machine has six boring spindles, utilizes a rotary hopper feed to direct split babbitt bushings to a plunger for press-fit assembly into part at the fourth station. All machining operations occur simultaneously in the five machining stations. 8-ft-high unit occupies floor space of 8 x 14 ft—*Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich*

a MIGHTY fine press...

built to withstand rigorous service

From crown to base, Minster S1's are truly MIGHTY presses. You get these features as Standard Construction:

- ★ Box type cast construction for maximum rigidity
- ★ All wear surfaces bronze lined, precision fitted and replaceable
- ★ Minster patented Combination Multiple Disc Air Friction Clutch and Brake
- ★ Exceptional Slide guiding and barrel type adjustment
- ★ Air Counterbalances on slide
- ★ Totally enclosed gears running in oil
- ★ J. I. C. Dimensions

MINSTER series **S1** straight side single point presses

for drawing, forming, trimming or blanking.

capacities from 50 to 600 tons

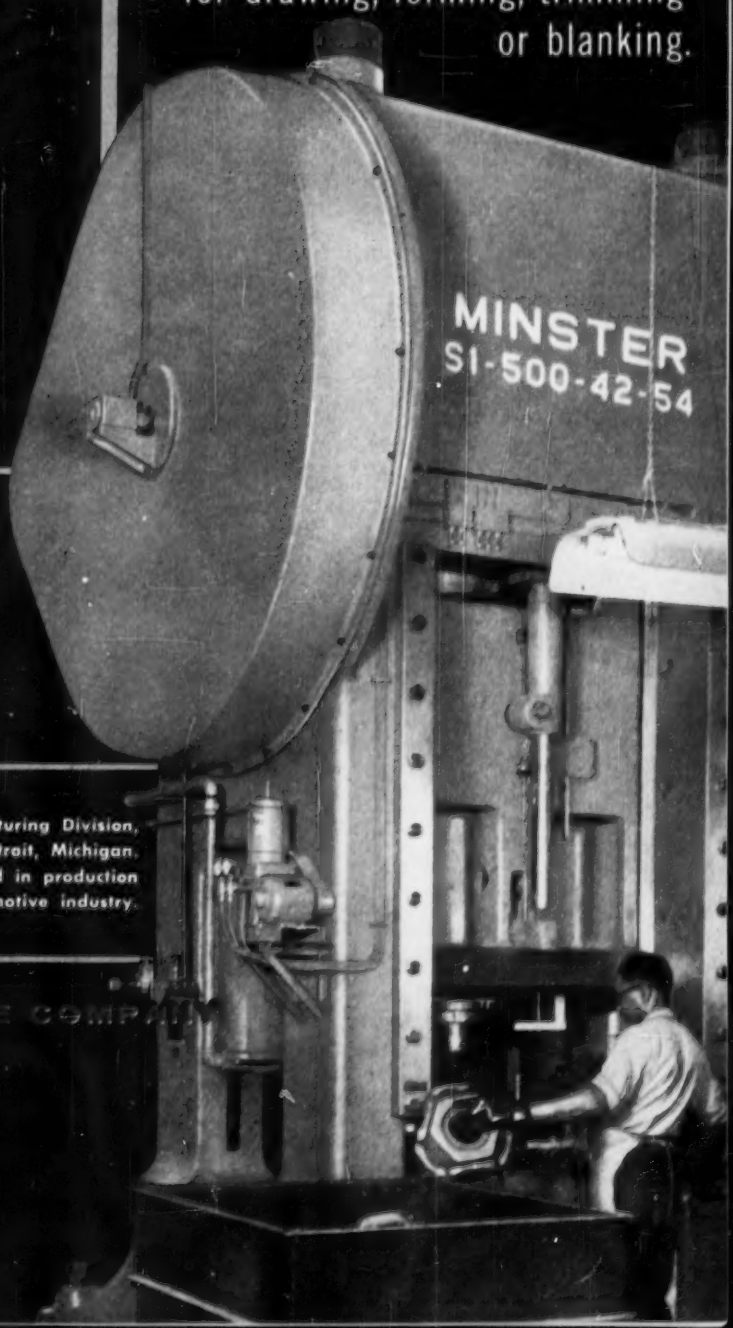
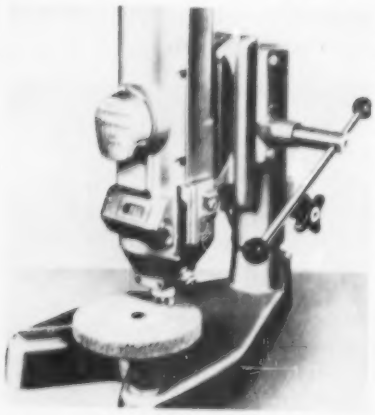


Photo courtesy of Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan. Minster S1-500 Press used in production of clutch coverplates for the automotive industry.

THE MINSTER MACHINE COMPANY
Minster, Ohio

MINSTER

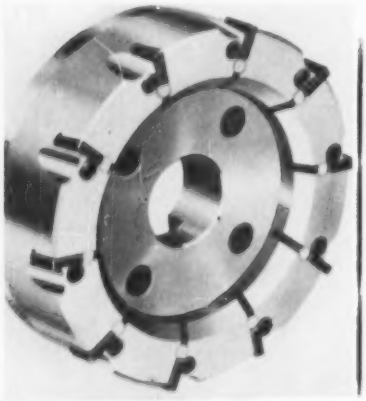


Scherr Machine Tests Hardness Of Grinding Wheels

Designed to produce a dynamic test by means of a reciprocating and rotating chisel held under a certain pressure, German-made instrument for determining grinding wheel hardness records the number of strokes of the revolving chisel required to reach a penetration of 3 mm. Force subjected to wheel grain is partly hammering and partly scraping one, very close to the force to which the wheel is normally subjected.

Test includes stroke frequency, recorded on a counter; chisel rotation at moment of impact; and hitting force of chisel, which is constant.

George Scherr Co, Inc, 200 Lafayette St, New York 12, N Y

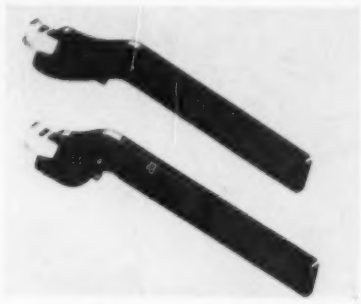


New Milling Cutter Uses Throw-Away Carbide Blades

Futurmill cutters use standard carbide lathe blanks or throw-away blades which can be indexed eight times before discarding.

New design is said to have extreme rigidity and almost 100% backup for the blades. Large polished chip pockets permit ample clearance even with smallest blade sizes. Cutters are made in positive or negative rake angles with size range from 2 to 20 in. in diameter. Blade sizes are from ⅜ to ¾ in. sq, and from ⅛ to 3/16 in. in thickness. Present cutter models use square blades only; cutters with round blades and other shapes can be furnished for particular applications.

Detroit Milling Cutter Co, 28625 Grand River, Farmington, Mich



Traycoff Parting Tools Have Interchangeable Inserts

Plunge and form-cutting tools with interchangeable HSS metal-cutting inserts and gooseneck-and-spring design were developed to replace more expensive forged gooseneck solid tools. Used on planers, shapers, and lathes, tools can cut slots ¼ in. wider than thickness of tool, are available in sizes for light or heavy equipment.

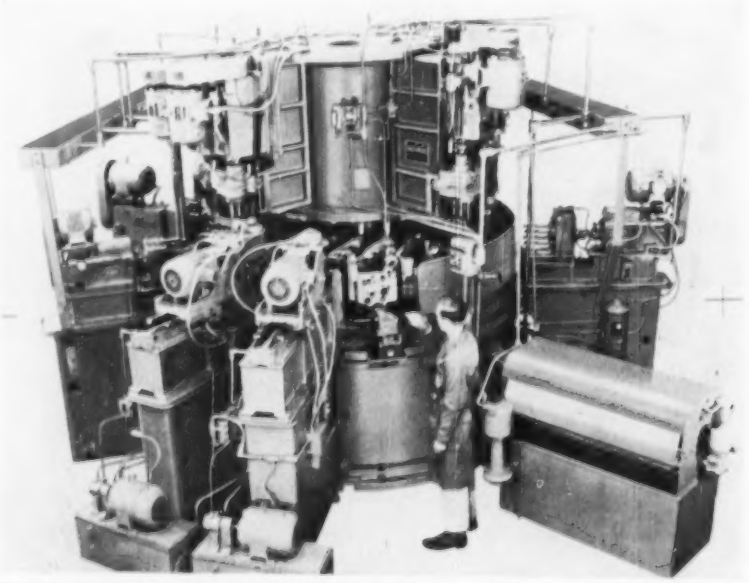
Following are typical applications: flat-finishing large-surface areas using ½ to ¾-in. feeds; plunge-cutting deep slots; rough- and finish-cutting deep channels and recessed areas; down-side-cutting full width of insert; forming a radius, angle, or any desired contour by installing insert to desired shape.

B J Traycoff & Co, 509 Carthage Ave, Kent, Ohio

Power Brake Halts Tool Drift After Power Is Turned Off

Supplied as self-contained packages, dynamic power brakes can be attached to company's radial-arm machines, are said virtually to eliminate "drift" time of cutting tool after the electrical current is shut off. Aside from obvious advantage of protecting operator, device also decreases down time of machine. Unit incorporates magnetic or manual motor-starting mechanism in addition to the electrical components controlling the braking action itself.

DeWalt, Inc, Div of American Machine & Foundry Co, Lancaster, Penna



REFRIGERATOR-COMPRESSOR HOUSINGS are machined on special 18-station machine which utilizes an 84-in.-dia table to process 120 parts per hr. Standard production units are used: total of 47 spindles is mounted on three 8-in. way-type units, six No. 2 Cam-Matic drill units, and eight Air-Oil-Matic drill units. Operations include milling, drilling, counterboring, spotfacing, boring, reaming, and tapping. Parts are loaded manually, and operation is completely automatic—*Morris Machine Tool Co, 933-16 Harriet St, Cincinnati 3, Ohio

Makes it possible to x-ray thicker sections –

cuts gamma ray exposure time

Read what the new Kodak Industrial X-ray Film, Type AA, does for you:

- Reduces exposure time—speeds up routine examinations.
- Provides increased radiographic sensitivity through higher densities with established exposure and processing technics.
- Gives greater subject contrast, more detail and easier readability when established exposure times are used with reduced kilovoltage.
- Shortens processing cycle with existing exposure technics.
- Reduces the possibility of pressure desensitization under shop conditions of use.

Whatever your present radiographic facilities, they'll do more work for you with Kodak's new Industrial X-ray Film, Type AA.

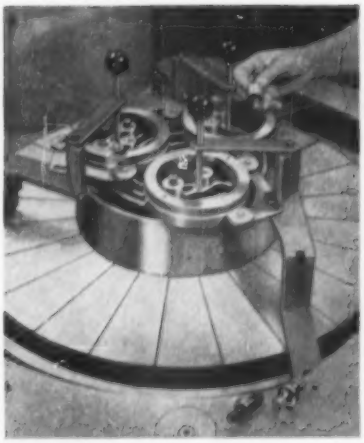
This film has greatly increased speed—especially pronounced with gamma rays and high kv. This means you can use shorter exposures with your gamma equipment. It also means you can radiograph thicker sections with your present x-ray equipment.

And with all this increased speed, the new film retains the fine sensitivity characteristics which made Kodak Type A the most widely used x-ray film in industry.

Kodak Industrial X-ray Film, Type AA, can save you time, can extend the possibilities of your present radiographic equipment. Find out all the details. Get in touch with your x-ray dealer or Kodak Technical Representative.

EASTMAN KODAK COMPANY
X-ray Division Rochester 4, N. Y.

Kodak
TRADE MARK

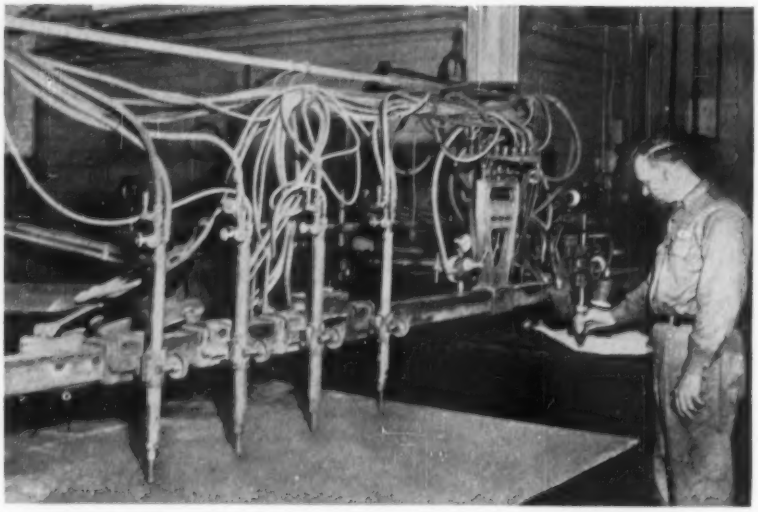


Lapmaster Tooling Permits Flat Lapping Shoulder Faces

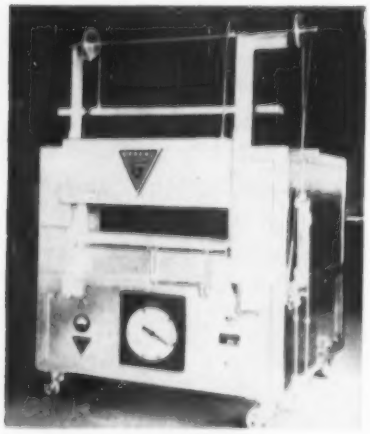
Tooling arrangement consisting of a 12-in. grooved lap plate mounted in the center of a 24-in. lap plate permits flat lapping of shoulder faces as well as other flat lapping. After operation, 12-in. plate can then be removed to permit lapping of other work on the standard machine.

Machine will generate surface flatness to less than one light band and finishes to 2 rms.

Crane Packing Co, Dept AMN, 6400 Oakton St, Morton Grove, Ill



MULTIPLE-CUTTING OPERATIONS are possible with Cut-O-Mation System, which combines several Model 98-T machine torches and Model 48-DC Oxygen Saver. Pre-heat oxygen pressures are controlled to as many as eight machine cutting torches, which are lined up in tandem formation and operated from a single station. Oxygen Saver permits full pre-heat flame which permits edge-starting or piercing to be accomplished faster. System works best with natural or propane gas, but may be used with any of the popular fuel gases—*Harris Calorific Co, Cleveland, Ohio*



Pereny Heat-Treating Furnace Offered in Portable Model

Model TF-12 heat-treating furnace has all power and temperature controls mounted in the base; wiring is all internal, and unit is ready for use upon connection to power source. Packaged unit has ball-bearing casters on base, and can be moved from one location to another easily.

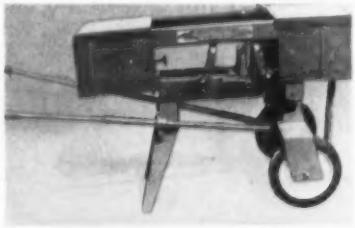
Chamber size is 36 x 48 x 12 in. Hearth is of U-shape design and contains silicon-carbide heating elements placed front-to-back on the side walls, providing an operating temperature of 2200 F and permitting maximum heatup in 3 to 4 hours. Door is of air-lift type and is foot controlled; it is also provided with a flame curtain which operates automatically.

Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio

Portable Tool Balancer Reduces Worker Fatigue

Designed for use on production lines, Model 10-C tool balancer is fully adjustable to balance any tool weighing from 5 to 10 lb. Device is mounted on beam or cable in work position above operator.

Aero-Motive Mfg Co, 1803 Alcott St, Kalamazoo, Mich



Metal Cutting Bandsaw Moves on Portable Chassis

Model 610 Series bandsaws can be transported from job to job on the Kalamobile chassis, available in two styles, M610D (dry) and M610W (wet). Chassis can be furnished for mounting any 610 now in service.

Lightweight unit is rolled on 12-in. solid rubber-tired wheels; collapsible handles, telescoped into the handle tubes, are rubber-gripped, and utilize a half-way stop for alternate degree of carrying leverage.

Kalamazoo Tank & Silo Co, Machine Tool Div, 500-508 Harrison St, Kalamazoo, Mich

Welsbach High Pressure Service Gas Valve with Revere Arsenical Bronze Stem.

REVERE

Deep-Drilling Brass Rod

Increases Tool Life over 200% for Welsbach Why not try it yourself?

In the manufacture of valves the Kitson Division of The Welsbach Corporation, Philadelphia, Pa., has to deep-drill brass rod. Originally the rod was free-machining brass. However, when Revere discovered the extent of the drilling it was suggested that our Mixture 252, Deep-Drilling Brass, would be preferable. This was tried, and the machine shop foreman reported that tool life was increased over 200%. In one item it is possible to bore with a single operation, against the former practice of withdrawing the drill three times in order to clear the chips. Revere's Deep-Drilling brass produces very small, easily cleared chips.

Another item is a high pressure gas valve, with a cast body and brass rod stem. The rod was changed to arsenical bronze, which costs a bit more, but it ended flaking and galling between stem and seat, and materially reduced rejects. Still another instance of Revere service concerns a hot water heater relief valve. The original model was cut out of bar stock. We suggested a high leaded brass tube, hexagon outside, round inside. This greatly reduces machining, has a better surface, and a better seat. Costs more by the pound, but saves more by the piece.

Revere salesmen and Technical Advisors are always glad to collaborate in seeking ways to save money and improve products. Perhaps we can help you!

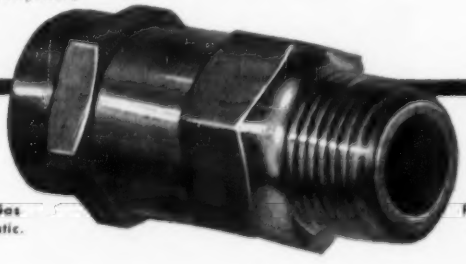
REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere



Welsbach Temperature-Pressure Relief Valve.

Welsbach Emergency Gas Shut-Off Valve, automatic.

Pressure Relief Valve for water heaters.

Solvent Vapor Degreaser Has Several Safety Features

Model 22 solvent vapor degreaser can be operated with trichlorethylene, perchlorethylene, or company's Vythene safety solvent, requiring only minor adjustments of the thermostatic controls. Main body is constructed of galvanized steel with outside coating of black resin to reduce heat loss. Stainless-steel coil is mounted as condenser inside chamber.

Lower thermostat prevents breakdown of chlorinated solvent because of thermal decomposition and shuts off machine for draining; it also prevents burnout of electric heating elements if level of solvent falls too low. Upper thermostat, mounted above condensing coil, acts as safety device to prevent solvent vapors from going out into room if water supply fails.

Model requires about 13 gal of solvent for operation and has capacity of about 350 lb of metal per hr. Price is $259 fob.

Tect, Inc, Dumont, N J

Thermosetting Adhesives Offered In Six Different Forms

Tygoweld adhesives, a line of thermosetting adhesives based on alloyed epoxy resins, is available as a paste, mat, powder, rod, liquid, or gel. Employing moderate cure temperatures, practical cure times, and low bonding pressures, adhesive produces strong welds between similar and dissimilar materials. Material is said to exhibit exceptionally high peel strength, as well as high impact strength.

In paste form, adhesive is a two-component system employing an amine activator. All other forms are one-component systems. Many of the forms contain their own temperature indicator, thus preventing undercure. In paste, powder, and rod form, several different types are offered. A trial kit containing instructions and an adequate supply of the principal adhesives is available for $8. Company also offers Bulletins TG 105 and TG 106.

U S Stoneware Co, Adhesives Div, Akron 9, Ohio

Wesson Adjustable Boring Tools Employ Indexable Carbide Tips

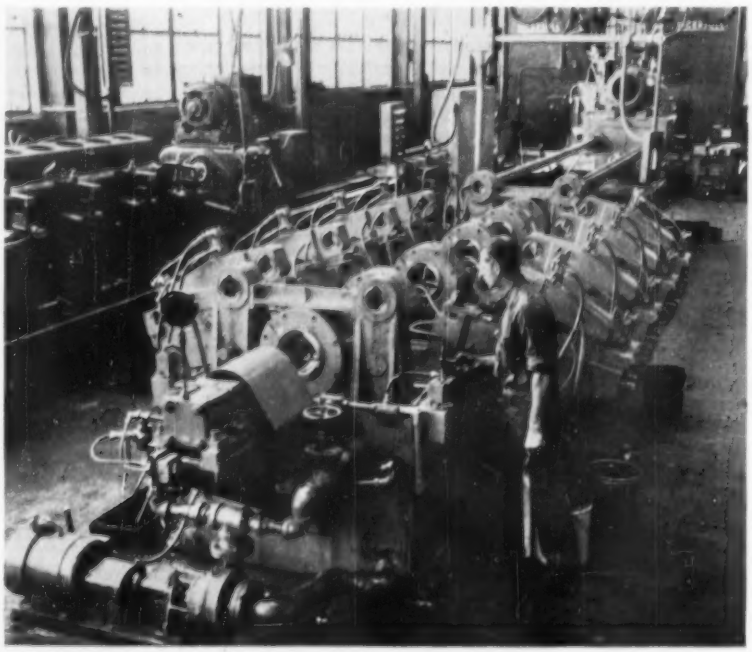
Boring tools fitted with square throwaway inserts permits indexing to eight positions before tip is discarded. Units are fitted with a vernier-screw adjustment for diameter of cut; circular dial has 20 graduations, each graduation representing a total of 0.001 in., so that each revolution of screw is equivalent to an advance or retraction of 0.020 in.

Adjustable built-in chip breaker also serves as clamp for boring tip. Serrations on clamp provide adjustment for positive chip control. Line permits use, with changes of only minor parts, of round, square, and triangular inserts. Relief grinding below cutting edge is avoided by locating cutting edge of tip slightly above center.

Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich

Cemented carbide blanks, Firlomet series, include standard and rectangular reamers designed in 11 sizes and in two grades. Solid square tool blanks range from 5/32 in. high, and 1 in. long to ⅜ x ⅜ x 1¾ in. Cutting edges are hot ground to 10°; available in five sizes in four grades.

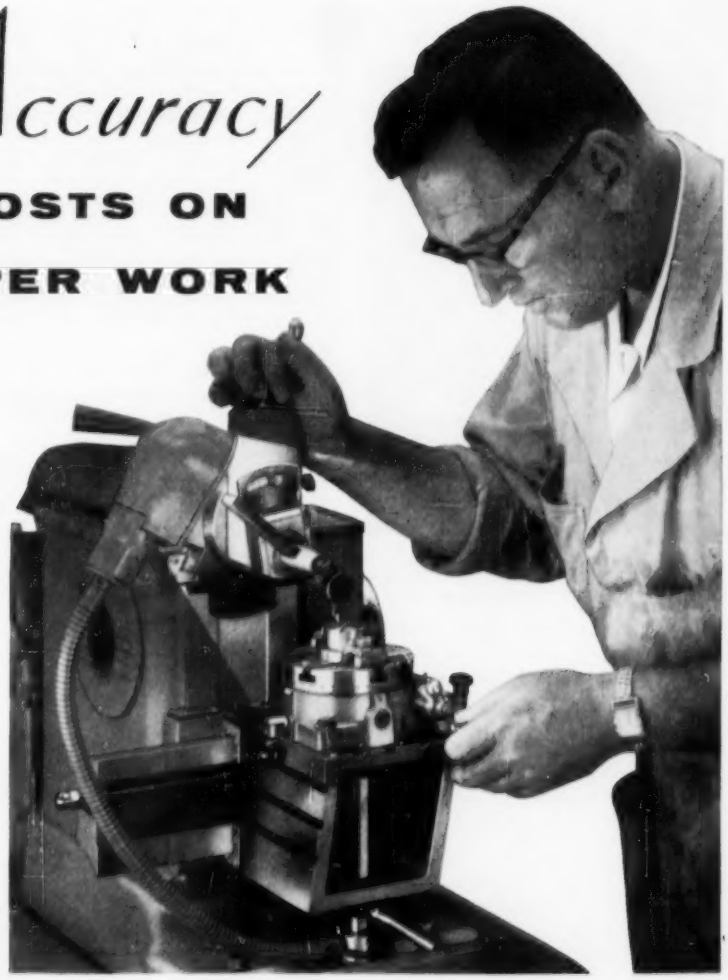
Firth-Loach Metals, Buttermilk Hollow Rd, McKeesport, Penna

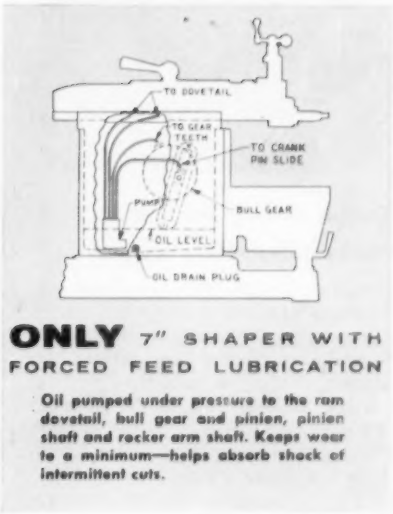


DIESEL-ENGINE BLOCKS are machined on large automatic boring machine built for Alco Products, Inc, by Moline Tool Co. Machine cuts camshaft and main-crankshaft bores for V-type 12- and 16-cylinder engines. Boring operation is accomplished in two phases: 3- and 7-in. boring bars rough-cut two camshaft and main-crankshaft bores, then 4-in. camshaft bars and 7-in. main-shaft bar finish the job. Engine thrust-bearing bore is completed in the first passage of the larger boring bar—*Moline Tool Co, Moline, Ill*

Speed-Accuracy

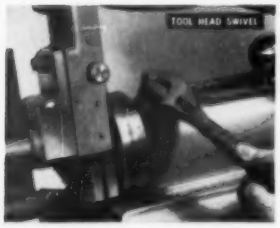
TO CUT COSTS ON SHAPER WORK

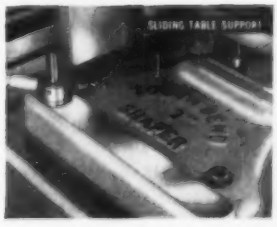




ONLY 7" SHAPER WITH FORCED FEED LUBRICATION

Oil pumped under pressure to the ram dovetail, bull gear and pinion, pinion shaft and rocker arm shaft. Keeps wear to a minimum—helps absorb shock of intermittent cuts.





The cost of machining small work drops when a South Bend 7" Precision Bench Shaper takes over. Its higher strokes per minute—greater ease of set-up—and handling speed give it a decided advantage over larger shapers that never were designed for small work. Also, its accuracy is a match for exacting toolroom requirements. If you are interested in better shaper work at lower costs, write for literature. Price, less motor—$551.

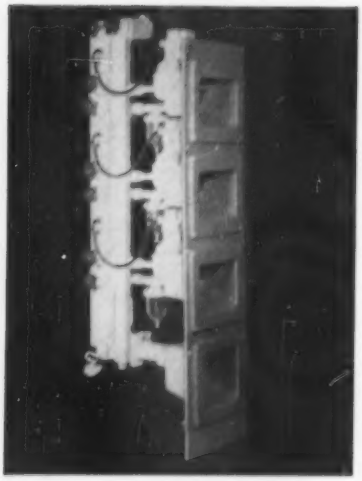
SPECIFICATIONS

Ram Stroke—0 to 7". *Strokes* per min.—42 to 195 approx. *Cutting Speeds*—3 to 114 ft. per min. *Tool Head*—3" vertical travel, 360° rotation. *Table*—9½" horizontal travel. 5" vertical travel. *Table Power Cross-Feeds*—(6) .002" to .012" (reversible).

SOUTH BEND LATHE SOUTH BEND 22, INDIANA

Builders of Lathes, Milling Machines, Shapers, Drill Presses, Pedestal Grinders

SOUTH BEND



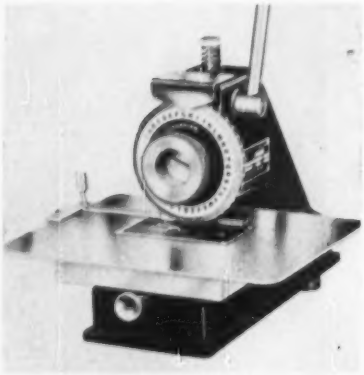
Clearing Air Manifold Operates Auxiliary Press Equipment

Auxiliary press equipment such as coil feeders, unloaders, and die lifters which require solenoid-controlled line air pressure for operation can be operated with automation air manifold, which replaces the usually elaborate network of piping and fittings required to install auxiliary equipment. Only two connections, one air inlet and one exhaust, are required to complete an installation. The remaining air circuits have been engineered into compact castings.

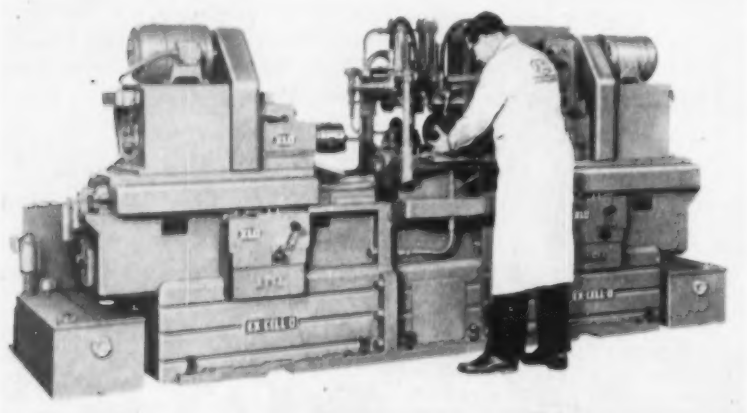
Minimum of space is required to house the unit. Only other devices necessary to operate automation equipment are an adjustable rotary-cam limit switch and timing relays, which can usually be incorporated into an enclosed press without increasing machine's over-all dimensions.

Main body of manifold is an aluminum-alloy casting. Honeycomb of cored parts forms both air inlet and exhaust circuits, and oil-tight compartments for electrical wiring. Weir-type valves are used for shut-off and exhaust functions. Solenoids can be unbolted from their cast bases and unplugged for complete removal. Lubricators may also be easily removed from their adapter blocks.

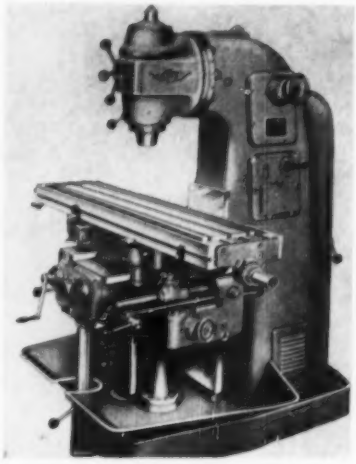
Clearing Machine Corp, 6201 W 63rd St, Chicago 38, Ill



NAMEPLATE PRESS stamps individual letters and numbers on all types of plates and tags. Descriptive catalog is offered—*Clearview Co, 172 Stanton St, New York 2, NY*



AUTOMOTIVE DIFFERENTIAL CASES are machined on special two-way precision boring machine, which finishes bearing areas inside cases. Operations are back-boring and chamfering two diameters, holding limits of ±0.0005 in. Two parts are clamped in fixture and two diameters in each part are bored simultaneously during each work cycle—*Excello Corp, 1200 Oakman Blvd, Detroit 32, Mich*



Danish Milling Machine Incorporates Safety Features

Pedersen Model VPV-2 milling machine, a product of Denmark, incorporates two safety features against damage to machine and cutters: engaging the rapid traverse lever reverses direction of feed (normally away from work); special friction clutch disengages feed when excessive overloads are encountered.

Vertical spindle of machine is supported by a heavy tapered roller bearing, and spindle sleeve may be moved 3 in. in axial direction and locked in any position desired. Spindle head may be swiveled to each side, and is provided with a graduated scale. Table and slides are lubricated by shot-lubricating system operated by lever on front of machine. All accessories for unit are available.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY

Manual shut-off valves for control of oil to 3000 psi and air to 2000 psi are available in port sizes of ¼, ⅜, ½, ¾, and 1-in. NPT. Valves are capable of withstanding velocities up to 60 fpm without modification. For convenience in operation, valve has a handwheel with position indicator, but may also be supplied with conventional handle. Unit incorporates "Shear-Seal" principle, consisting of a pressure-balanced, self-aligning tubular sealing ring in constant contact with a flat porting disk or rotor containing the flow passage. Flow is through seal and never across sealing surface, and square external corner of seal wipes rotor clean, keeping out dirt.

Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif

WITH CHASE® S-19 PROCESS BRASS STRIP

CHASE S-19 BRASS is *unique* through and through! Special manufacturing techniques give it an exceedingly fine, uniform grain structure, and it has unusually high ductility. It is adaptable for forming or even relatively deep-drawing articles which are surprisingly scratch and dent resistant. They will buff or polish more easily, too.

It takes precise Chase quality control at the mill to produce the superb finish, stiffness and formability of Chase S-19 brass—*yet it costs you no more than commercial soft brass!* Call in a Chase representative for all the facts, today!

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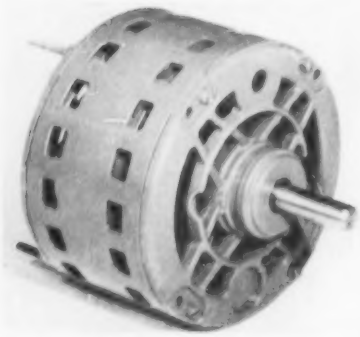
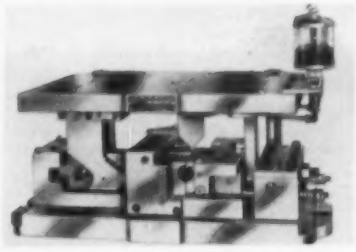


G E Shaded-Pole Motor Reverses Positively at High Speeds

Available in 1/15 through ⅛-hp ratings with single and dual speeds, shaded-pole motor reverses positively at high speeds without a capacitor and with low reversing current. 5½-in.-dia motor is suited for use in air-moving devices, such as ventilators and coolers, with moderate radial and axial thrust loads. ⅛-hp size reportedly can deliver in excess of 3500 cu ft of air per min.

Designated KSR39, motor weighs between 9 and 10 lb, can be mounted with through-bolt construction with shaft-end or opposite shaft-end connection. Other types of mountings can be furnished.

General Electric Co, Schenectady 5, N Y



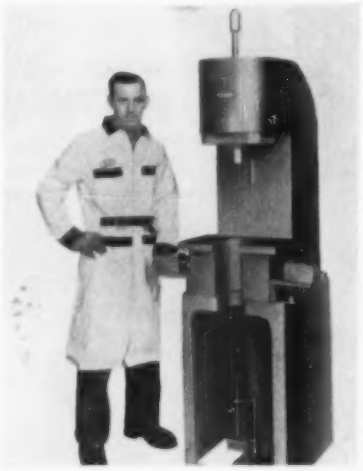
CUT-OFF UNIT for shearing pipe and tubing attaches to punch press, reportedly will shear off pipe in ½-in.-or-more lengths to within ± 0.010 in. Depending on length and wall thickness, unit will handle 1000 to 2000 pieces per hour. All blades and blocks are interchangeable, and are obtainable in any size of diameter within range of tool. Cut-off comes in three sizes to handle tubing in following ranges: up to ½-in. OD x 3/32-in. wall, 2-in. OD x ⅛-in., and 3-in. OD x 3/16-in.—*Vogel Tool & Die Corp, 1825-N 32nd St, Melrose Park, Ill*

Bench Drill Unit Performs Triple Job with One Loading

Incorporating two of company's automatic drilling units, one with a two-spindle head, bench-type unit performs two drilling and one counterboring operation automatically with one loading. Operator loads and clamps part in simple fixture, then depresses start-cycle switch; left-hand drilling unit automatically feeds forward and drills holes. Withdrawal of spindles causes righthand unit to feed in automatically to counterbore one of the two holes previously drilled.

With this setup, the three operations can be performed at a rate in excess of 300 pieces per hour. With slight changes in mounting and fixtures, machine is readily adaptable to drilling a variety of parts.

Gouro-Nelson Co, 1933 Antoinette, Detroit 8, Mich

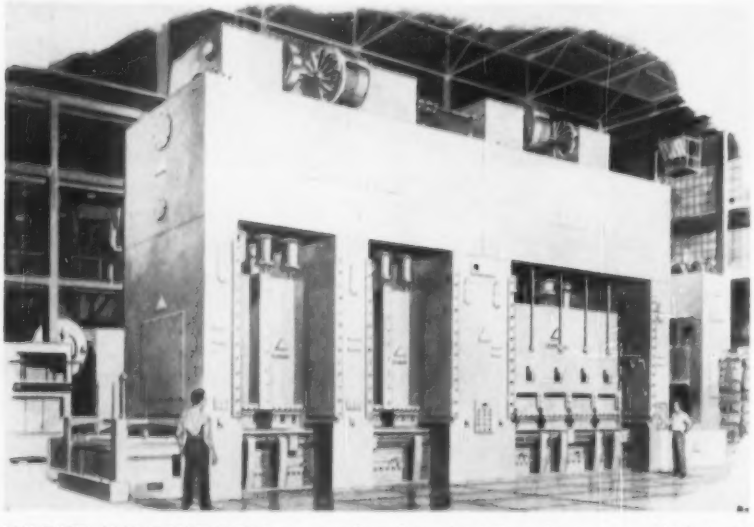


Air-Hydraulic Press Has 15-ton Capacity

Model C-500 air-hydraulic press has a rated capacity of 15 tons which increases to 21 tons with line pressure of 100 lb. Machine is 15 in. wide, 26¾ in. deep, and 40 in. high on 34-in. stand.

Model has 8¼-in. throat and delivers a 6-in. stroke at 10 cycles per min. Other throat and stroke sizes are available. Three types of controls are offered: dual-hand, footpedal, and fully automatic.

Air-Hydraulics, Inc, 202 Belden St, Jackson, Mich



WASHER AND DRYER TOPS are produced in giant Transflex press, which is 58 ft long with twin drives, two crowns, and two beds sharing common uprights. Unit has transfer feed stroke of 50 in. and will produce over 700 stampings per hr. Press produces washer tops for 4 hr and then converts to 4 hr of dryer-top production, with only a 10-min changeover period. Modular construction of press permits separating unit into two presses or addition of other units to increase the number of stations—*Clearing Machine Corp, Div of U S Industries, Inc, 6201 W 63rd St, Chicago 38, Ill*

CORRECTION—The Model GA-4 controlled-atmosphere heat-treating furnace described in a recent issue (AM—Aug 13 '56, p186) was described as having chamber dimensions of 10 x 8 in. The maker, Cooley Electric Mfg Corp of Indianapolis, Ind points out that the complete chamber dimensions are 10 x 8 x 18 in. Furnace, which is designed for the general hardening of tool steel, has automatic controls throughout.

NEW

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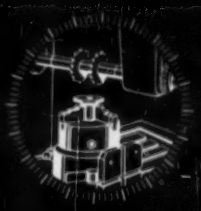
MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

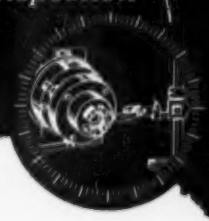


straddle milling

milling

jig drilling
with either micrometer or "Jo" block setting

inspection



Write for free catalog "*Erickson Master Spacer*" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

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The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

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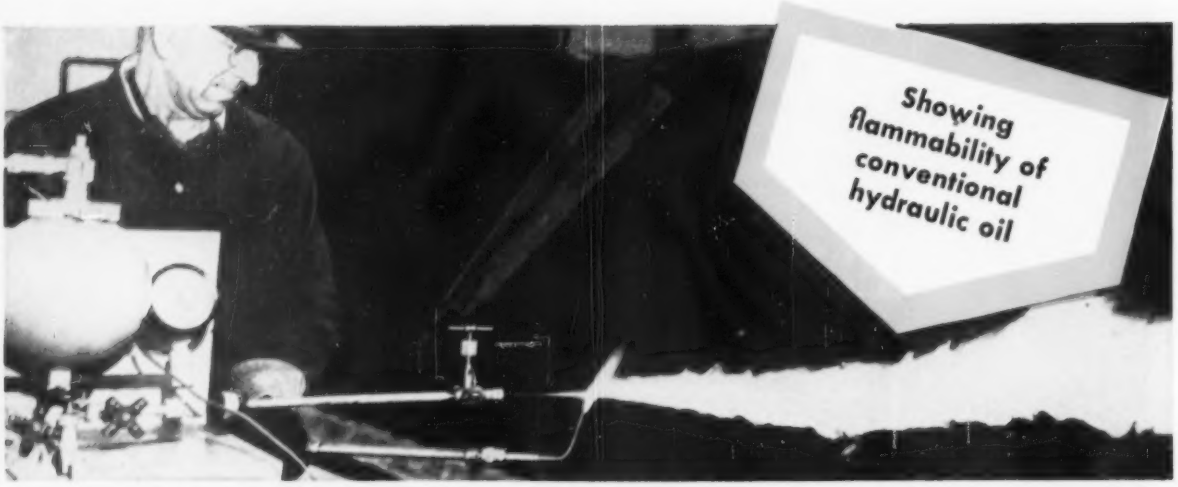

Flame tests prove its fire-snuffing ability

SHELL IRUS FLUID 902

Entirely new formula: Shell Irus Fluid 902 is a special formulation . . . product of three years' development and field testing. It is suitable for nearly all industrial hydraulic systems, as a direct replacement for presently used oils. *Here is a fire-resistant hydraulic fluid that can be widely used.*

Non-corrosive: Shell Irus Fluid 902 contains no corrosive ingredients. It has no harmful effects on seals, fittings or bearings. It does not promote rust.

No major modification necessary . . . simply clean present fluid thoroughly out of system and replace directly with Shell Irus Fluid 902. You can use it with complete confidence. Write for test data and all information.

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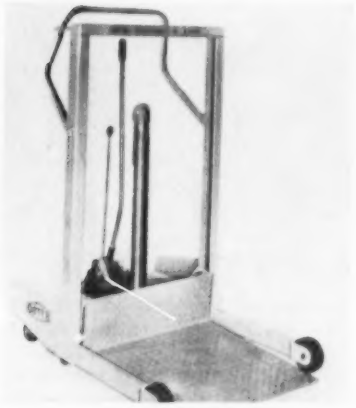
SHELL

Small Diameter Grinding Wheel

New model Grind-O-Flex, 3 in. in dia, 2 in. wide, is available in various grits for deburring, smoothing flash, and chamfering.

Unit, mountable on any spindle or chuck of present portable or stationary equipment, is particulary adaptable to sharp bends, contours of small radii, and confined areas such as inside of tubing.

Merit Products, Inc, 4023 Irving Pl, Culver City, Calif



500-lb-Capacity Hydraulic Lift Handles Small, Heavy Loads

Hand-operated, portable unit can be used as a stacker or a work platform. Carrier is furnished with a 24 x 24-in. reinforced steel platform that lowers flush to the floor to slide under loads, has adequate lift height to reach benches or machine beds.

Lift height is 42 in., turning radius, 50 in.; overall height 54 in.; length 43¾ in.; weight, 254 lb.

Oster Manufacturing Co, Box 4326, Cleveland 32, Ohio

Universal cylinder mountings developed to eliminate misalignment problems are available in two forms: hinge-mount cylinder with universal mounting brackets at each end, and a cylinder with universal trunnion

There's a BIG difference in floor absorbents

MAKE THIS DISCOVERY!

RIGHT IN YOUR OWN OFFICE you can test the difference of Eagle-Picher Industrial Floor-Dry with whatever oil absorbent you're now using. You'll discover it actually absorbs as much as 100% or more liquid per pound than other floor drying materials.

YOU'LL ALSO PROVE that Eagle-Picher Floor-Dry retains its skid-proof granular mineral form even when saturated. It doesn't mud or pack. Light in weight, it spreads easier and covers a larger area. Non-combustible, it has no chemical reaction. And possessing unusual reflective power, Floor-Dry makes working conditions bright and pleasant, as well as safe!

Since 1843 EAGLE EP PICHER

WRITE TODAY. Our Eagle-Picher representative will bring the portable laboratory to your office where you may make this test yourself. The Eagle-Picher Company, Cincinnati 1, Ohio.

Photo courtesy of Caterpillar Tractor Co., Peoria, Ill.

it's only part of the HTM* story...

STRENGTH

High ultimate strength of HTM castings helps the famous Cat D7 Tractor do the tough jobs day-in and day-out. Vital parts, such as the front idler adjusting nut shown, are made from HTM metal . . . the metal with the high ultimate strength that resists wear and fatigue under heavy loads.

And there are lots of other "plus" advantages in HTM castings. For example, they possess excellent non-seizing properties . . . can be either liquid or air-quenched . . . can be given a smooth finish. Perhaps *most important of all, HTM machinability index ranges from 80 to 90 (B1112 steel = 100).*

HTM castings can often reduce manufacturing costs, weight and assembly time . . . can increase quality and sales potential of *your* product. AA-3746-A

*HTM—*High Tensile (Heat-Treated) Malleable*

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the nation's largest independent producer of malleable and pearlitic malleable

and universal mounting bracket for the rod end. Common applications include operation of hopper gages, elements rotating about shafts, and objects moving on wheels. Bulletin 76.

Hanna Engineering Works, 1765 N Elston Ave, Chicago 22, Ill

Combustion Tube Furnace Has Variety of Uses

Model CF-4SA, a 4-kw electric resistance element unit, has one 5-in.-OD combustion tube, max furnace temp of 2750 F. In addition to its use as a standard tube furnace, it can be modified for high-temp pot furnace operation, or a constant-temp source for optical calibrations. Heat is supplied by eight silicon-carbide heating elements, 8-in. effective heating length.

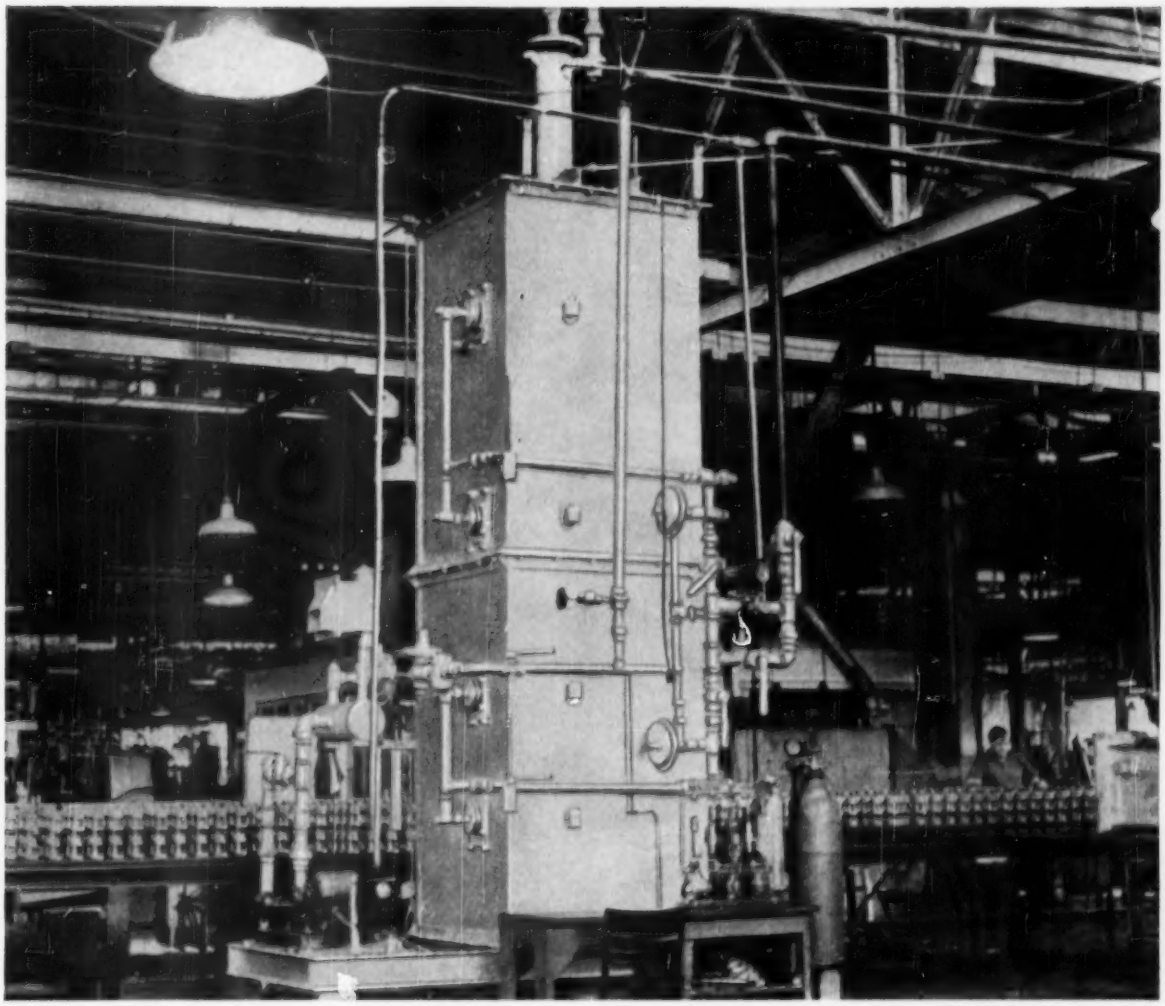
Large-size tube permits use of furnace for produtcion runs of small parts; it can be furnished with water jacketed Inconel tube assembly for heat treating applications up to 2150 F requiring protective atmosphere.

Lindberg Engineering Co, Laboratory Equipment Div, 2450 W Hubbard St, Chicago 12, Ill

Mobile X-Ray Unit Has Capacity Equal to 1-Million Volt Machine

Isovolt 400kv Mobile Constant Potential X-ray machine increases the penetration of mobile X-ray from 4 in. of steel to 6 in.

Supply voltages are 220 and 440,



1,500,000 cfh of atmosphere

That's the combined capacity of all the Surface RX® gas generators sold since this first one started operating April 4, 1941. This was the first practical catalytic gas generator for continuous bright gas carburizing. . . and it's still in use at Warner Gear Division, Borg-Warner Corp.

Such long-term reliability is only one of the reasons why so many plants standardize on Surface gas generators. Controllability, flexibility, turn-down operation, variety of gases and capacities are some of the other reasons. We'll be happy to tell you more about them.

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HEAT TREATING EQUIPMENT

BARNESDRIL
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give you **2 Stage*** **COOLANT CLEANING**

for selective degree of coolant clarity

BarnesdriL Engineers provide two distinct stages in coolant cleaning in the new Kleenall Unit by combining *practical magnetic separation for removal of ferrous particles, with *positive cleaning by filtration to elliminate non-ferrous or other objectionable foreign matter. With the control inherent in this method it is possible to give you the exact degree of coolant cleanliness that is practicable for your production operations. Results up to 99% removal of all coolant wastes are readily accomplished.

Complete Lab Facilities for Your Convenience

Typical microphoto of composite swarf from a high production cutting operation.

In their modern coolant laboratory, these engineers can precisely measure waste particles and classify them by physical types. Percentage of contamination is thus determined, and they are then able to select a filter media and size of unit to give you the degree of coolant clarity you desire.

Why not ask them to analyze your coolant cleaning problems and make recommendations for obtaining the most practical results. Any BarnesdriL representative will gladly supply you with complete details.

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COOLANT BARNESDRIL CLEANING

FILTRATION DIVISION
BARNES DRILL CO.
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60 c. Interchangeable tube heads are available in 150kv/20ma capacity of either fine-focus or 360° radiation beam emitting type. Unit can also be furnished in 300kv capacity.

Holger Andreasen, Inc, 703 Market St, San Francisco 3, Calif

Multi-Purpose Marking Machine Handles Steel, Iron, Plastics

Model 9AH, designed for marking steel, stainless, or cast iron, can be used for marking plastic parts, products, and materials with only minor adjustments.

Unit is driven by an air cylinder provided with foot or hand valve; in high-production lines, valve can be electrically controlled. Standard 6-in. stroke can be reduced to meet any requirements; long-stroke models are available. Machine produces up to 1000 marks per hr, depending upon size of part and manner of feeding. Acroleaf feed is automatic; complete marking can be accomplished at each stroke of the press, including application of color. Disconnection of electric heating element, and stoppage of tape feed, adapts unit to marking of steel or other metals. Power is provided by standard airline up to 150 psi.

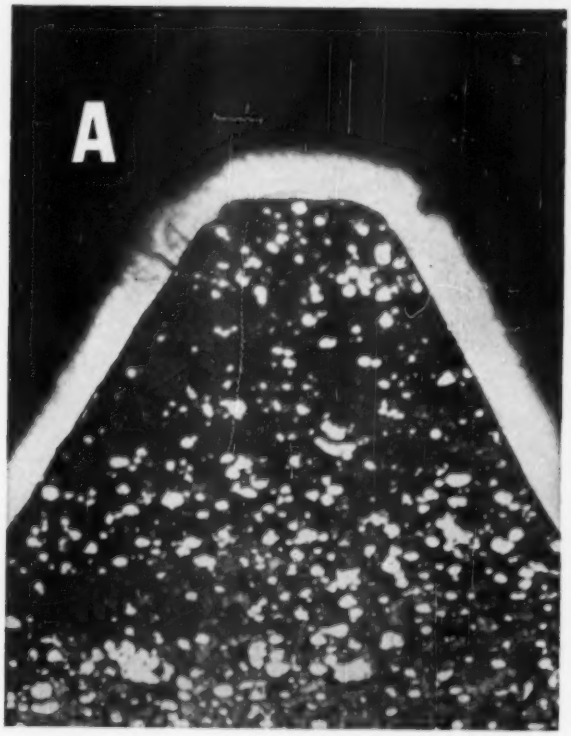
Acromark Co, 7-13 Morrell St, Elizabeth 4, NJ

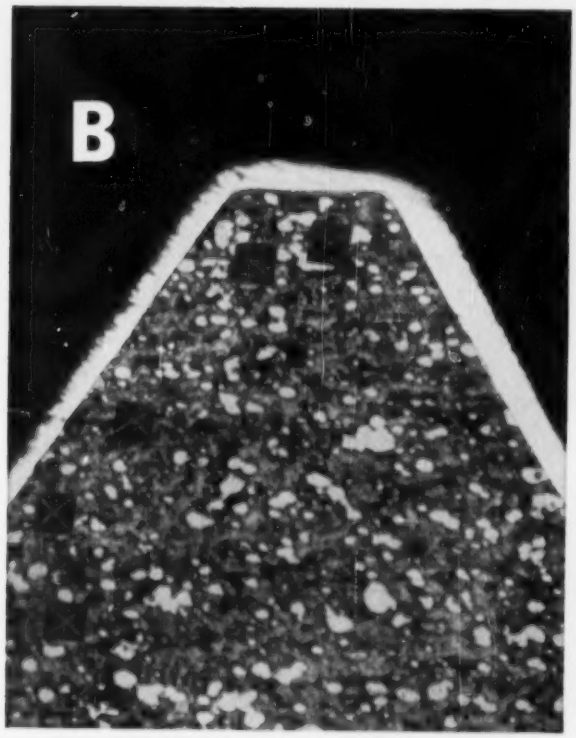
Exhaust silencer designed for use on Torit cabinet dust collectors is available in 5 models to fit various-size collectors. Units are rectangular in cross-section and are interlined with 1-in. closed cellular vinyl foam that reportedly absorbs 80% of the noise without restricting air flow.

Torit Mfg Co. Dept KP, 287 Walnut St, St Paul 2, Minn

(Continued on page 208)

WHICH OF THESE TAP SURFACES WAS REJECTED BY HY-PRO'S MICRO-HARDNESS TESTER?





The flaws in Tap A were revealed by Hy-Pro's Micro-Hardness Tester—part of Hy-Pro's exclusive 3-way Quality Control!*

THE machines that grind a tap surface can generate a great amount of heat. Without Hy-Pro's control, this heat can burn and soften the tap, weakening it to a serious extent.

Such weakening is invisible to the naked eye. But Hy-Pro's Micro-Hardness Tester reveals the extent of the flaw every time! What does this mean to you? Productivity per tap has been increased by 20 to 25 times through the selective work of Hy-Pro's Micro-Hardness Tester. And that means time and money saved on your production line.

The Micro-Hardness Tester is an important part of Hy-Pro's exclusive 3-way Quality Control, which guarantees you the finest taps in the world. Incidentally, the Hy-Pro Micro-Hardness Tester is the only known microscopic hardness examination for both interior and exterior surfaces. Even the tap's cutting edges are checked down to half a thousandth of an inch.

If you would be interested in taps by Hy-Pro—the Tap Specialists—see your nearest Hy-Pro distributor or call us direct. Believe it or not, Hy-Pro Taps cost no more than ordinary taps.

*The small dark squares are diamond impressions used in testing the structural strength.

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More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

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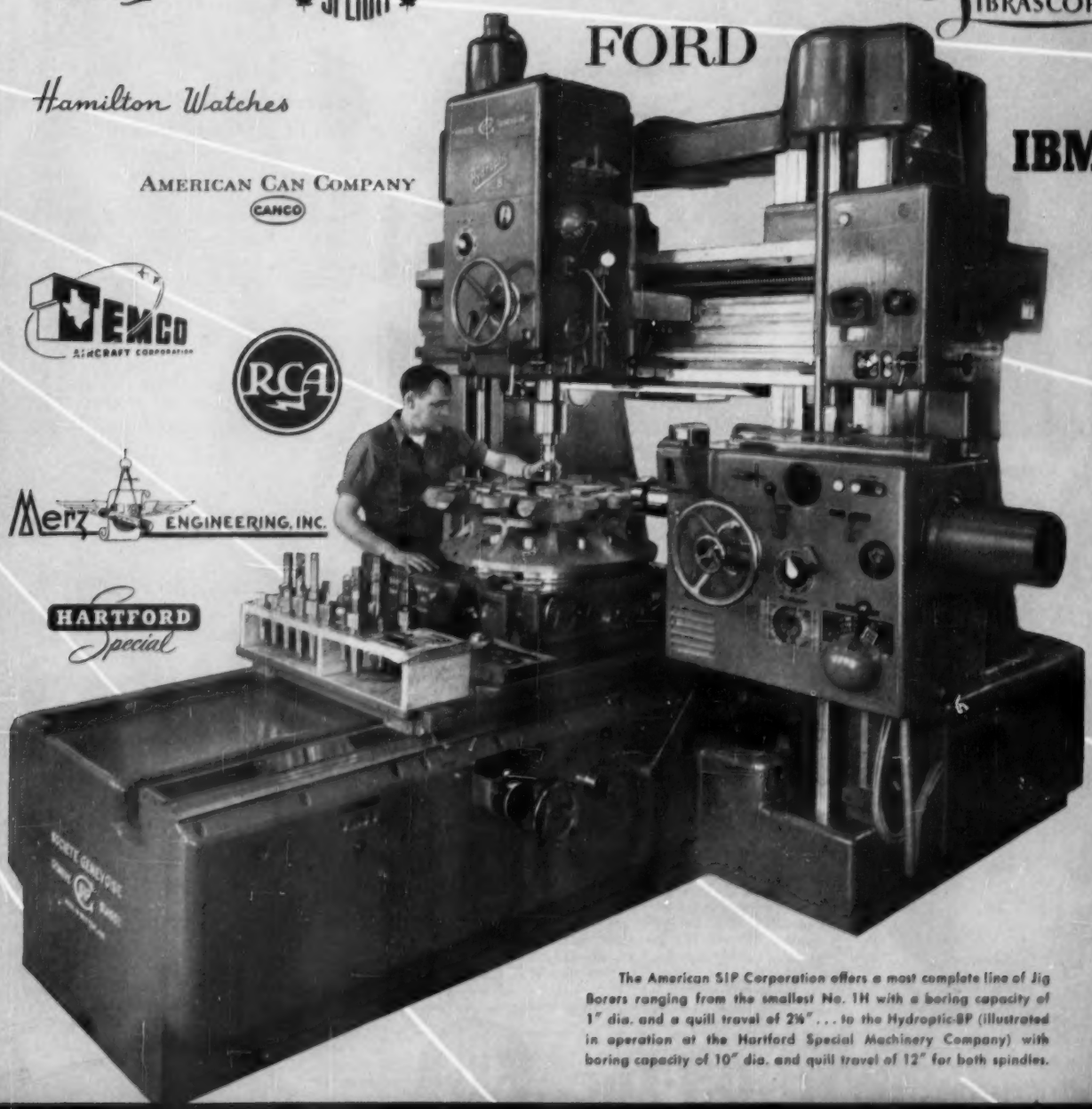

The American SIP Corporation offers a most complete line of Jig Borers ranging from the smallest No. 1H with a boring capacity of 1" dia. and a quill travel of 2¼" . . . to the Hydroptic-8P (illustrated in operation at the Hartford Special Machinery Company) with boring capacity of 10" dia. and quill travel of 12" for both spindles.

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IMPORTANT DATA NOW AVAILABLE ON NEW K. R. WILSON PRESSES FEATURING GREATER PRODUCTION SPEED, ACCURACY AND EFFICIENCY

Mr. Harold A. Moyer,
Sales Manager
Hydraulic Press Division
K. R. Wilson, Inc.

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MODEL 37KMD
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MODEL 200S — 2424
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Reports Mr. Moyer — "Recent months have seen an unprecedented rate of new press development at K. R. Wilson, designers and builders of hydraulic presses since 1916. Among the new presses are a series of Four Column, Guided Platen Presses featuring remarkable versatility and accuracy, and a new 10-Ton Capacity Bench Arbor Press offering many exclusive features. New bulletins have just been released, giving detailed information on new Wilson Presses. You'll find it pays, in terms of greater production speed, accuracy and economy, to request these bulletins *now*."

SEE THESE NEW K. R. WILSON PRESSES IN CLEVELAND

K. R. Wilson will exhibit its newest hydraulic presses at the 38th National Metal Exposition and Congress in Cleveland, October 8 thru 12. See their exclusive features and advantages by visiting Booth No. 2407 in the Upper Exhibition Hall of the Public Auditorium.

38th NATIONAL METAL EXPOSITION AND CONGRESS

Booth No. 2407

HYDRAULICS DIVISION

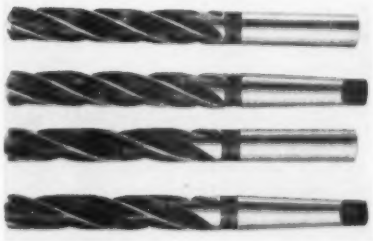
K·R·WILSON·Inc.

210 MAIN ST., ARCADE, NEW YORK

Hydroelectric Tractor Can Be Ridden or Walked

K Hydroelectric, Model KTR, tractors are manufactured in 12, 18, and 24-v systems, capable of speeds up to 6 mph. Hinged control handle may be brought forward, and truck operated as a standard hand-motorized unit. Operator can control truck from a standing-riding position by pulling handle back.

The 24-v unit has three speeds forward and reverse; during walking operation, there are two speeds. Unit develops up to 900-lb drawbar pull. *Lift Trucks, Inc, Cincinnati 14, Ohio*



CORE DRILLS, specifically designed for enlarging holes, are constructed so that center portion of drill does not cut. Furnished in three and four flute types, sizes are from ¼ to 3 in. in taper shanks, from ¼ to 2 in. in straight shanks—*Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich*

Battery charger for rider lift trucks is permanently mounted on power unit, so that truck battery can be given a power boost whenever truck is not in operation. Battery is charged by plugging charger into any 110 or 220 v, 60 c outlet. Charger is completely automatic, and rate of charge is controlled by state of charge of battery. There are no mov-

(Continued on page 212)

Bob Rossi, Chief Engineer, tells Roy Johnson, Plant Manager

"We switched to Formbrite —and saved 12 cents apiece!"

.032" gage 70-30 Formbrite is used for this 4½" diameter rearview mirror head shown full size. Strip is 5 1/32" wide supplied in heavy coils for long press runs. Copper, nickel and chromium plating on a solid brass base provides a bright, rustless, long-lasting outdoor finish.

Peerless Rearview Mirrors. "Flight-Wing," below, and the newer "Director" model, left. Housings and mounts are chromium-plated zinc-base die castings.

This easy-to-polish, superfine-grain drawing brass has been slashing finishing costs in plant after plant, on all kinds of jobs. Now Peerless Accessories Co., of Mount Holly, N. J., reports:

"To our line of lighting and safety automotive accessories, we've recently added two rearview mirror assemblies. We had been using regular drawing brass for the dished head until your representative persuaded us to try Formbrite. Here are the results, based on a very careful cost study:

Finishing procedure using regular drawing brass	Present procedure using Formbrite*
1) Grease grinding or "cutting"	Not necessary with Formbrite
2) Buffing	Light buff
3) Copper strike	Copper strike
4) Nickel plate (.00045")	Bright nickel plate (.0003")*
5) Buffing nickel	Not necessary
6) Chromium plate	Chromium plate
Cost 27¢ each	**Cost 15¢ each**

"That's a saving of 12 cents apiece. Multiply it by 3,000 to 4,000 a day and it becomes important money!"

*Formbrite's superfine grain made possible a lighter but equally serviceable plate of bright nickel

Surprisingly, Formbrite doesn't cost a penny more. Find out for yourself how its superfine grain, excellent drawing properties, strength, and scratch resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask us about a sample lot. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 5870

Formbrite FINE-GRAIN DRAWING BRASS

an ANACONDA® product

made by The American Brass Company

IT'S EASY TO ORDER THE

From this "Buffalo" Line

1 **CAPACITY RANGE** from the smallest commercial drill sizes to 1½" in mild steel.

2 **CHOICE OF FEEDS** — sensitive or power feed, hand or foot controls.

3 **CHOICE OF SPINDLE SPEEDS** — optional motor speeds and adjustable V-belt drive for the right drilling, tapping or reaming speed; or variable speed drive in the famous "RPMster".

4 **CHOICE OF ONE TO SIX SPINDLE MODELS** for single or multiple operations in all capacities.

5 **ACCESSORIES** — such as slow-speed, tapping and mortising attachments, work lights, vise tables and coolant systems.

6 **ARRANGEMENTS** — horizontal duplex, radial, inverted head and many others to make more jobs easier.

BUILT-IN ACCURACY, CONVENIENCE, LONG LIFE

For 79 years, "Buffalo" has been building exclusively industrial drills with the best and most practical features, which we call the "Q" Factor*:

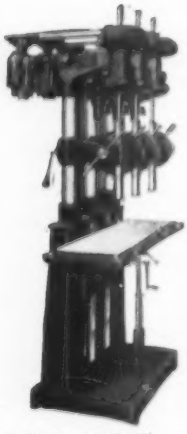
1 **PRECISION BALL BEARING SPINDLES** — high grade steel, ground, polished and dial gauge tested for trueness; take-up adjustment of ball bearings for wear.

2 **CONVENIENT CONTROLS**, table and head adjustment cranks for quickest and easiest handling — excellent visibility of all parts and work.

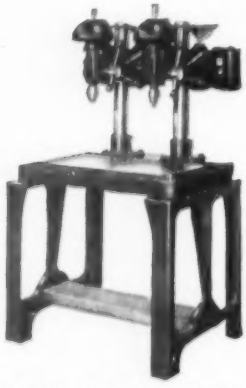
3 **STRONG, RIGID CONSTRUCTION**, including oversize columns, spindles, bases and true work tables. In pedestal models, ways are hand scraped.

Write us about your drilling problem — we'll mail you Bulletins and recommendations.

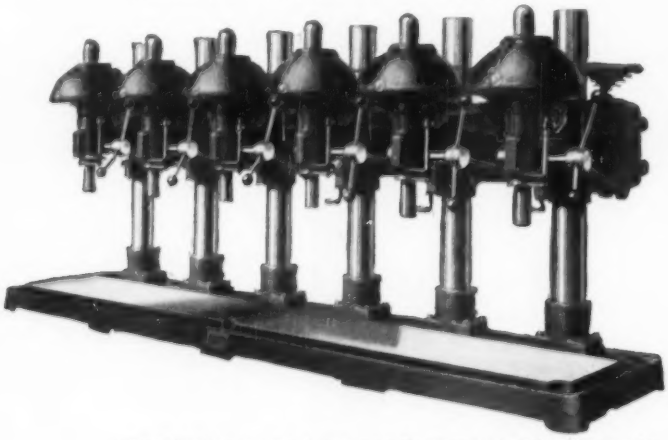
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



⅜" No. 16 Drill



½" No. 15 2-spindle drill



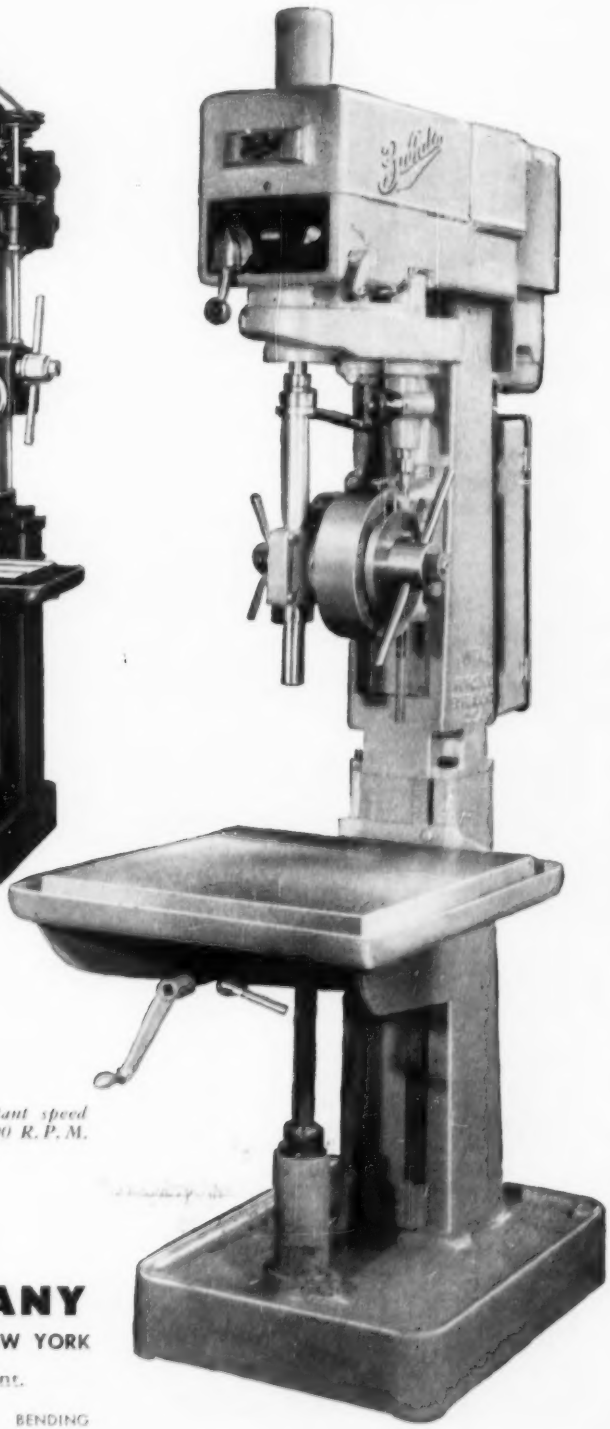
"Buffalo" No. 18 Drill in 6-spindle Bench Model—1" capacity

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

DRILLING PUNCHING SHEARING BENDING

BEST DRILL FOR THE JOB

"Buffalo" 3-spindle No. 22 Round Column Drill — power feed. 1½" capacity in mild steel.



The "RPMster" — instant speed control from 100 to 3000 R.P.M.

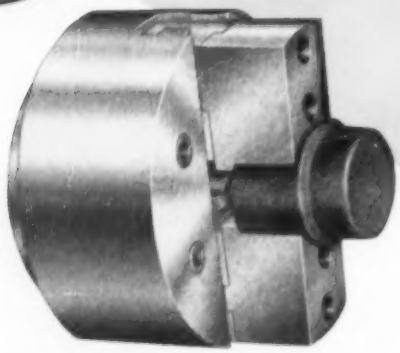
BUFFALO FORGE COMPANY

509 BROADWAY **BUFFALO, NEW YORK**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING

POWER CHUCKS



for more gripping power– higher production

Famous S-P cam and lever design holds the work tighter, permits cost cutting heavy feeds and multiple cuts. S-P cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure . . . an important safety factor. Balanced for high rpm.

S-P SELF-CENTERING CHUCKS are built in Universal American Standard models, sizes 6" – 8" – 10" – 12", and Serrated models in 8" – 10" – 12" sizes. Two or three jaws.

S-P COMPENSATING CHUCKS grip out-of-round work with equal pressure on each jaw. Available in 8" – 10" – 12" sizes, two and three jaw models, American Standard or Serrated.

S-P ROTATING CYLINDERS

Air and Hydraulic

Adequate stroke for long jaw travel of S-P Chucks. Balanced for high rpm on machine tools and other applications. Details in Catalog No. 105 (Air) and Bul. 201 (Hydraulic).

S-P Power Chucks are installed as original equipment by Bardons & Oliver, Cleveland Automatic, Cone Automatic, Ex-Cell-O, Jones & Lamson, Monarch, Warner & Swasey . . . and many others. Representatives in principal cities. Prompt deliveries. Send for catalog No. 105. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio.

SPecify SP

THE S-P MANUFACTURING CORP.

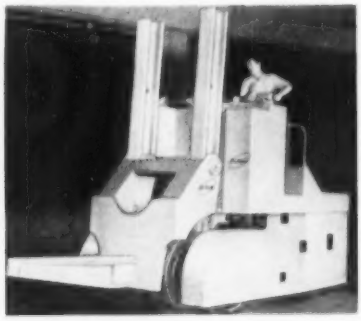
SOLON, OHIO • IN GREATER CLEVELAND

ESTABLISHED 1916 A BASSETT COMPANY

NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS
POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES, ACCESSORIES

ing parts, fans, relays, or contacts. Various sizes and types are offered for various makes of trucks.

K-W Battery Co, 3670 W Howard St, Skokie, Ill



Line of Heavy-Duty Ram Trucks Has 20,000 - 80,000-lb Capacity

Electric-powered units are said to have narrowest over-all width of any comparable model available.

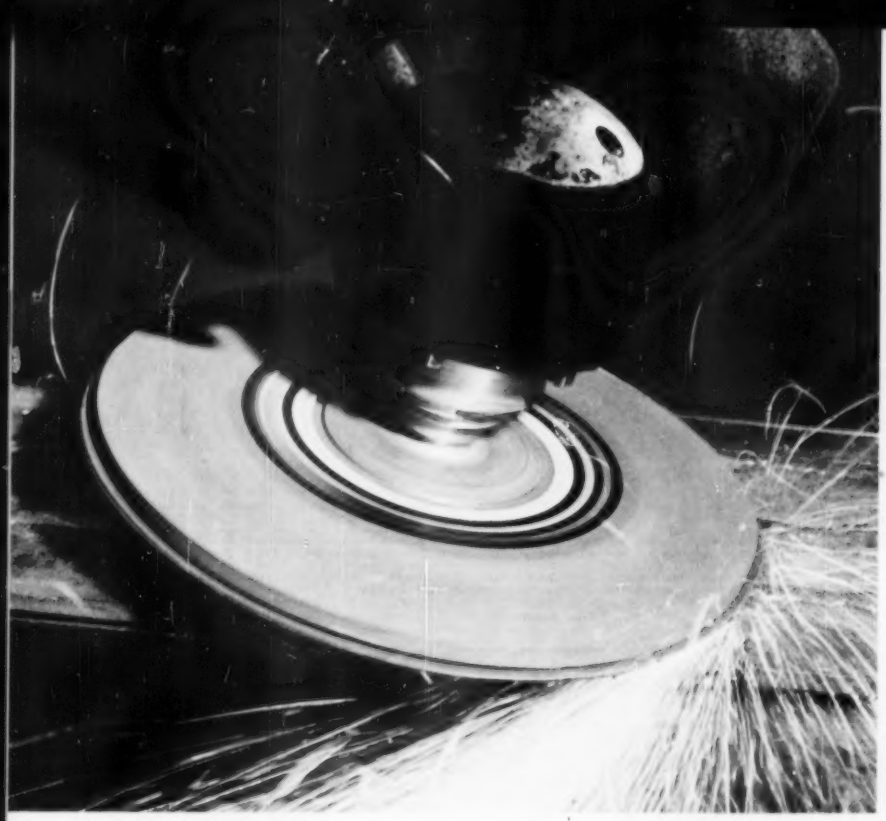
Other design features include special power plant design; caster trailing axle; steel-mill-type electrical controls; redesigned lifting mechanism; hydraulic power steering and wheel brakes; ease of maintenance.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio

TENSION - COMPRESSION LIQUID SPRING, incorporating single piston with double action, has 1100-lb preload, 11,000-lb endload. Housing is 1⅝ in. in dia by 8½ in. long. Details in catalog SS—*Taylor Devices, Inc, 188 Main St, N Tonawanda, NY*

Barrel deburring compound, Oakite FM 183, is an alkaline material which can be used alone or with stones in the barrel deburring of small parts. Used in concentrations of 1 to 5 oz per gal of water, compound can be used also for grinding off sharp edges, removing tarnish and heat scale, improving surface finishes, and deburring steel and zinc.

Oakite Products, Inc, 124 Rector St, New York 6, NY



JOB-RATED Type "C" DISC

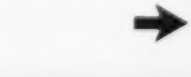
The sensational new 3M Type "C" Disc is stronger, sharper and longer-cutting than any other disc of its type on the market today. It's *shape-controlled* and *job-rated* (for edge sanding, flat sanding or solder sanding) to fit your specific operations. It's the top quality disc that eliminates problems of disc cupping and breaking—assures you highest consistent performance.

NEW... from 3M COMPANY Research

a portable metal grinding and finishing team

PORTABLE "PG" WHEEL

The amazing new portable "PG" Wheel is the finest, most revolutionary, metal-polishing tool available—designed to replace set-up wheels, felt wheels, rubber bonded polishing wheels, greaseless compound wheels. It's *self-conforming* to curves and contours . . . retains its shape *throughout* its working life . . . needs no breaking in or dressing. It cuts costs, increases production, improves finishes.



3M's NEW PORTABLE TEAM

JOB-RATED
Type "C" Disc

SHAPE-CONTROLLED — amazing new treatment during manufacture gives new 3M Type "C" Discs the best resistance to effects of humidity and temperature of any disc in the world (see chart, overleaf).

JOB-RATED—new 3M Type "C" Discs are now job-rated for specific work . . . edge sanding . . . flat sanding . . . solder sanding or oil filling operations. This advance results from 3M's pre-eminent position in quality control. New controls on fibres—constant improvements in resins—are just two of the factors making it possible. Most important, in shape-controlling *and* job-rating is 3M's miraculous new coated abrasives making machine—the world's largest and most modern—which controls quality to a degree impossible to equal elsewhere.

Shown in picture above is the amazing new 3M Type "C" Disc at work on a hot-rolled high tensile steel transport tank at the Standard Steel Works, Kansas City, Missouri. Here, a test was conducted on weld grinding performance of the new "C" Disc, Grit #36 vs. performance of a standard "C" Disc, Grit #36. Results: the new 3M Type "C" Disc removed stock 25% faster—lasted 10%-15% longer.

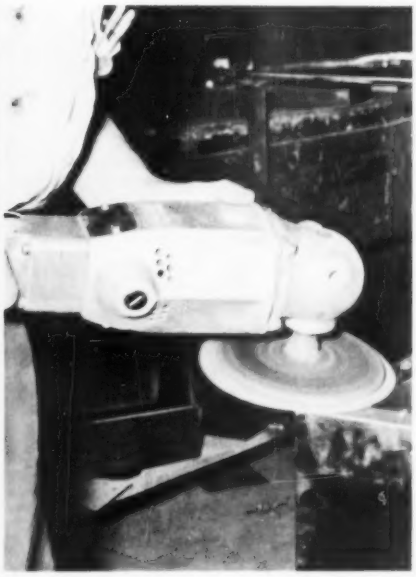
Shown above, the remarkable new portable "PG" Wheel is blending a weld on a stainless steel dairy tank at the Standard Steel Works, Kansas City, Missouri. Here the weld is to be blended with a #4 finish on the tank (shown covered by a protective tape). Formerly, this manufacturer was using set-up wheels for this operation—found them slow, unsatisfactory. The portable "PG" Wheel increased production—did a better blending job than was ever before possible.

PORTABLE
"PG" WHEEL

PORTABLE—this smaller version of the standard "PG" Wheel is a remarkable new metal-polishing tool, ideally suited for both portable and bench grinding machines. Formed of die-cut segments of cloth-backed 3M Coated Abrasive, bonded with resin and locked into a hub.

SELF-CONFORMING—the new portable "PG" Wheel makes filling a problem of the past because its coated abrasive cannot become filled. The mineral grains *and* backing wear away together—conforming to the shape being polished—and presenting an always new surface to the work. The portable "PG" Wheel is perfect for rust or dirt removal, blending disc-sander patterns, weld polishing, metal-feather edging *and* soft-metal polishing, tar-grinding or removing runs and sags on fibre glass.

obsoletes other metal grinding and finishing methods with far greater speed and savings like these . . .



EDGE SANDING welded corners of steel cabinet units with the *new* 3M Type "C" Disc. The Underwood Company, Pittsburgh, Pennsylvania, finds that Grit #60 "C" Discs provide fast cut-down of excess weld metal, leave moderate scratch pattern for easy matching to a standard #4 finish on the unit.

FLAT SANDING welds on steel refrigerator cabinets with *new* 3M Type "C" Disc at Midwest Manufacturing Corp., subsidiary of Admiral Corp. Manufacturer finds *new* "C" discs tailor-made for his moving line operation — finds too, that down-time for disc-changing is cut to a minimum.

SOLDER SANDING and weld grinding on various areas of assembled funeral caskets. The Cincinnati Coffin Company, Cincinnati, Ohio has found that the new job-rated "C" Discs cut faster — fill less — and last up to 50% longer than the discs they had previously used for these operations.

FLEXIBLE SHAFT refinishing of used aluminum aircraft propeller blades with a portable "PG" Wheel. American Airmotive Corp., Miami, Florida finds the "PG" Wheel ideal for restoring blade finish. The "PG" Wheel outlasts the set-up wheels previously used by a ratio of 20 to 1 — *and* works faster.

FIXTURE-HELD FLEXIBLE SHAFT blending of inside diameter of steel turbine center with a Grit #120 portable "PG" Wheel. Twin Disc Clutch Co., of Rockford, Illinois, found the new "PG" Wheel ideal for this operation as it conforms itself to follow the contour of the turbine center — performs the blending operation in one pass.

BENCH GRINDER polishing of farm machine part with a Grit #150 portable "PG" Wheel. Minneapolis Moline Co., Minneapolis, Minn., had difficulty removing sharp edges — parts' shape made set-up wheel or belt polishing hard. "PG" Wheel cuts, polishes in 1 operation *and* conforms to forgings' small radius.

In the above pictures, protective guards have been removed for photographic purposes

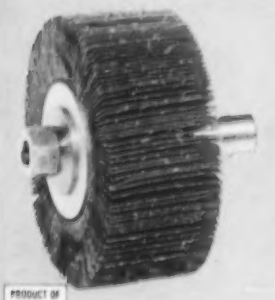
SPECIFICATIONS

Job-rated, shape-controlled 3M type "C" DISC

PRODUCT OF 3M RESEARCH

	15% relative humidity	45% relative humidity	60% relative humidity
OLD Type Discs	5.0	2.0	1.8
NEW 3M Type "C" Discs	2.5	0.5	0.0

3M Portable "PG" WHEEL



PRODUCT OF 3M RESEARCH

Wheel Diameter	Grits	Width	Recommended Speed—RPM
6"	50 thru 320	1-1½-2-2½-3	5,000
7"	"	"	4,500
8"	"	"	4,000
9"	"	"	3,500
10"	"	"	3,000
11"	"	2-2½-3	3,000

3M ABRASIVES

Made in U.S.A. by MINNESOTA MINING AND MFG. CO., General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City. Makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

MINNESOTA MINING AND MANUFACTURING CO.
Dept. AK-96, St. Paul 6, Minn.

- ☐ Rush me full facts on the new job-rated, shape-controlled "C" Disc
- ☐ Rush me full facts on the new portable "PG" Wheel
- ☐ Please have a 3M Representative call

NAME.....

COMPANY.....

ADDRESS.....

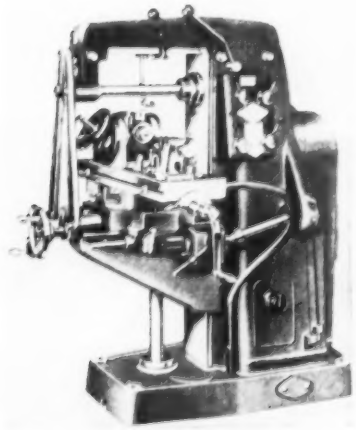
CITY.....ZONE...STATE.....

Deep Hole Gun Drill

Unit is adaptable for either regular or special production operations, regardless of hole depth, with drill ranges of from 0.125 to 3½ in. in diameter.

Elements are cutting tip, tubular fluted shank, and driver by which drill is held in a spindle adaptor or a stationary holder. Outer and inner nose angles can be varied within wide limits and are designed for the material to be drilled and requirements of finished hole. Tool reportedly cuts through materials which cannot be drilled successfully with ordinary units, and at much higher rates of speed.

Eldorado Tool & Mfg Corp, 542 Boston Post Rd, Milford, Conn



MILLING MACHINE, Pedersen Model VPU-O from Denmark, is an intermediate machine built for average capacities and embodying all the automatic features of heavier units. Automatic feeds in three directions are a standard feature. Full range of accessories is offered—*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY*

SPECIFY ADAMAS PREMIUM GRADE 548

for all finishing and semi-roughing on tough alloy steels, with or without interrupted cuts

- MORE WEAR RESISTANT
- MORE SHOCK RESISTANT
- GREATER STRENGTH
- RESISTS CRATERING

Formulated specifically for finishing and semi-roughing operations on high alloy steels, ADAMAS PREMIUM GRADE 548 is the hardest carbide grade used successfully on interrupted finishing cuts.*

When encountering cratering in machining the 300-series stainless steels with straight tungsten carbide grades, change to ADAMAS PREMIUM GRADE 548. You will get far more crater resistance without sacrificing edge wear resistance.

Particularly suitable for application on automatic machines, ADAMAS PREMIUM GRADE 548 is excellent where some shock and excessive edge wear are encountered on light cuts.

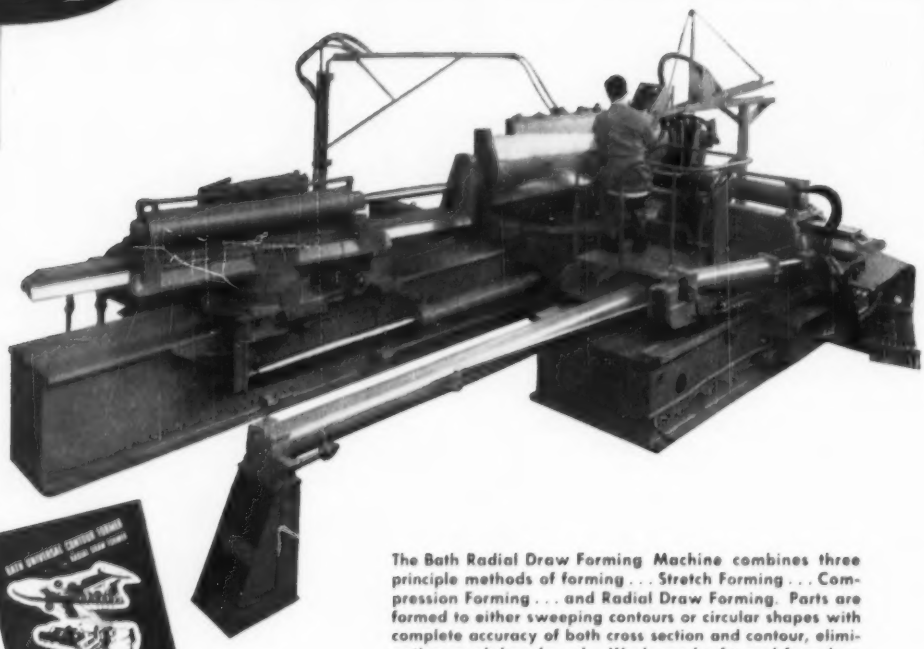
**For continuous cuts on low carbon steels, use ADAMAS standard grades C and D.*

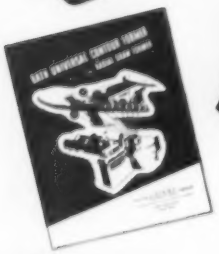
SPECIFY ADAMAS PREMIUM GRADE 548 FOR... MORE CHIPS AT LOWEST COST!

ADAMAS

ADAMAS CARBIDE CORPORATION, KENILWORTH, NEW JERSEY

BATH ...RADIAL DRAW FORMERS...



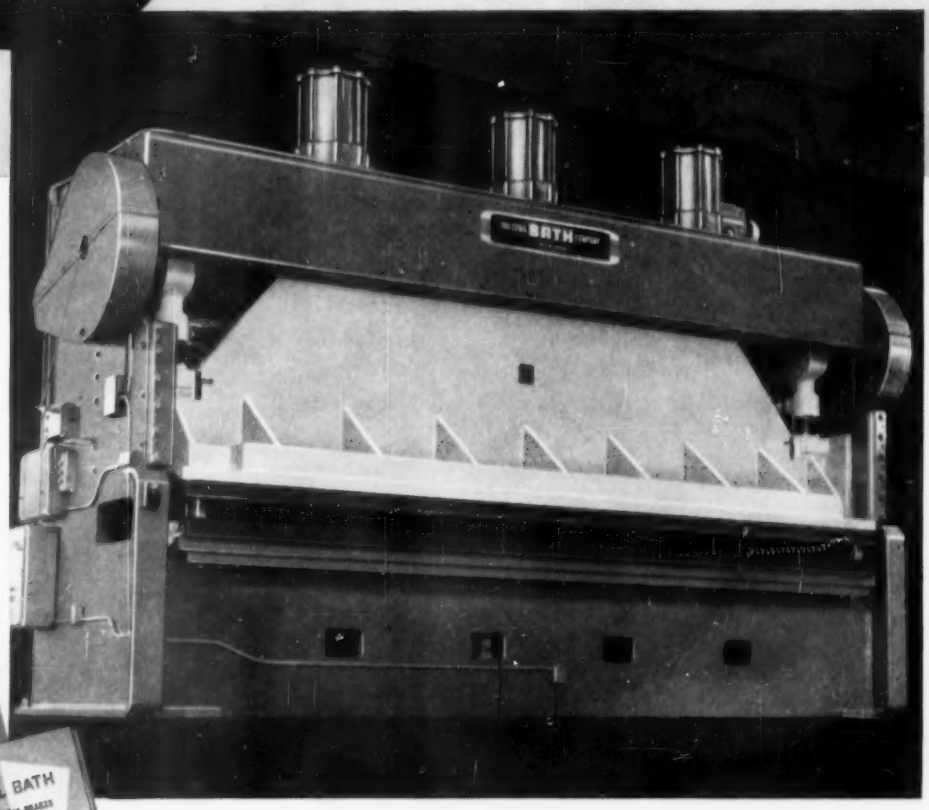


The Bath Radial Draw Forming Machine combines three principle methods of forming . . . Stretch Forming . . . Compression Forming . . . and Radial Draw Forming. Parts are formed to either sweeping contours or circular shapes with complete accuracy of both cross section and contour, eliminating much benchwork. Work can be formed from bar, strip, sheets, tubes or extrusions. Stainless steel, aluminum, titanium or other ductile metals are readily formed into complex parts or components. Standard machines are available from 7 to 200 ton capacities . . . machines to special specifications in larger sizes. Send for literature covering the specifications of the Radial Draw Former. It holds the answer to modern contour forming problems.

BATH ...CONTRACT FORMING...

The Metal Forming Division specializes in metal curved parts to your specifications. Extensive Radial Draw Form equipment as well as more conventional forming equipment serves the needs of prime and sub-contractors in the aircraft, jet engine, guided missile and other fields. The contract forming catalog is yours for the asking . . . it covers our complete contract facilities.

BATH ...PRESSES AND BRAKES...



The outstanding feature of the Bath Press Type Brake is combined versatility and high speed production with strength and rigidity. Bath Press Type Brakes have large bed and slide areas for accurate work on large panels and for progressive operation work on smaller parts. Bath Press Brakes for forming and punching work are available in 100, 120, 150 Ton models. Many of the *standard* features of these presses are "optional extras" on other makes. Illustrated catalogs are available.

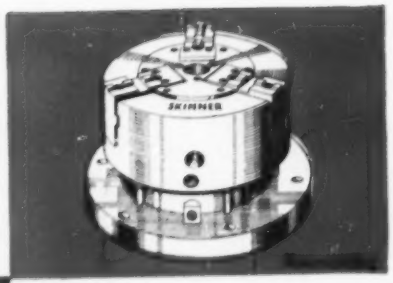
You're Invited...

While you are in Cleveland for the **METAL SHOW** plan time to see us in our new plant in Solon, Ohio, only 17 miles southeast of **METAL SHOW HEADQUARTERS.** We'll be glad to arrange transportation.

THE CYRIL BATH COMPANY

32340 AURORA ROAD • SOLON, OHIO
(LOCATED IN THE GREATER CLEVELAND AREA)
Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

SKINNER
POWER CHUCK FIXTURE



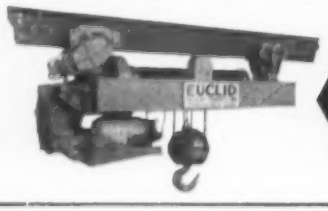
. . . combines accuracy, speed and power!

The lowest, most compact unit of its kind! It's air-operated, durable — ideal for drilling, milling and transfer machines, and for assembly operations. Wedge action provides tremendous gripping power. Self-centering, self-locking. Available in 8″, 10″ or 12″ dia., with 2 or 3 jaws. Operable with Skinner hand valve or foot valve; ⅜″ pipe connections. Maximum air pressure: 100 lbs. *Write for Bulletin.*

THE CREST OF QUALITY

THE **SKINNER CHUCK COMPANY**
203 Edgewood Ave., New Britain, Conn.

For HIGH LIFTS and *FAST TRAVEL* with HEAVY LOADS



Here is a typical monorail type, motorized trolley

EUCLID *TRAVELING* HOIST

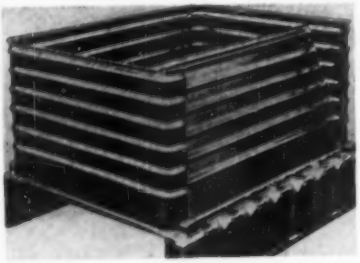
It has a capacity of 15 tons and is equipped with a four part cable and a large drum to afford an unusually high lift.

Similar hoists are available in capacities up to 30 tons with geared or powered trolleys; with two hooks, if needed; also with push button, pendant or remote controls. Larger hoists may be had with operator cabs for inside or outside use.

Euclid's broad experience enables its engineers to design special types of grappling equipment for use with cranes or hoists. Counsel is available without obligation. Consult us.

THE EUCLID CRANE & HOIST CO.
1367 CHARDON ROAD • CLEVELAND 17, OHIO

WRITE FOR CRANE CATALOG

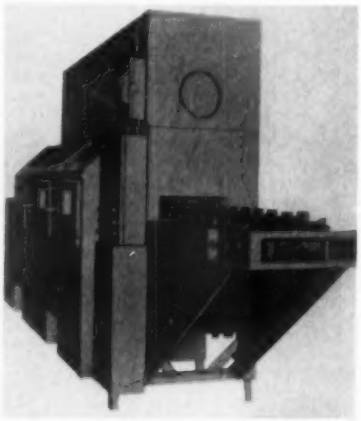


Materials Handling Box Reduces To 1/5 of Its Original Size

Corrugated steel box, said to eliminate up to 66% of space needed to store and ship empty boxes, has collapsible sides which are easily set up or folded down. Sides are locked by pin and slide bolt, providing rigidity.

Unit can be tiered when loaded, unloaded, or folded. It can be furnished in various widths, heights, and lengths, and designed for two or four-way fork truck entry.

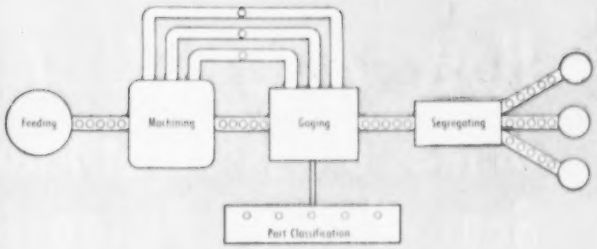
Republic Steel Corp, Pressed Steel Div, 6100 Truscon Ave, Cleveland, Ohio



POLISHED, FLAT ALUMINUM SHEET used in electrical-appliance trim is finished on special version of pressure-blast wet-blasting unit, which features custom-molded workholding devices, in-line conveyorization, and automatic rinsing and drying. Parts are blasted uniformly by a cluster of traversing guns. Silk screening machine masks portions of work where brightness must be maintained; blasted finish is satin —*Cro-Plate Co, Inc, 747 Windsor St, Hartford 1, Mich*

Stack clamp designed for use with Mobilift trucks features a hydraulically operated load stabilizer that holds column-stacked cases firmly to the pallet. Device consists of a ball-

AUTOMATION DEMANDS *RELIABLE CONTROLS*



Dimensional control is the very heart of automation for the metalworking industry. Consequently, care in the selection of in-Process and Post-Process control devices is very important.

As a long recognized leader in air, electric and electronic gaging, Sheffield is prepared to furnish either:

- **Packaged controls and tooling ready to install**
- **Complete automation gaging and transfer systems ready to operate**

FUNCTIONS and ADVANTAGES

- Determine minute dimensional variations, rapidly and with repetitive precision
- Initiate warning signals
- Actuate control mechanisms
- Segregate acceptable, oversize and undersize parts
- Accurately classify parts by sizes
- Accommodate almost limitless range of tolerances
- Operate with interchangeable tooling
- Are small, compact and easily mounted
- Have unusually long, trouble-free service life
- Are easily interchanged

7125

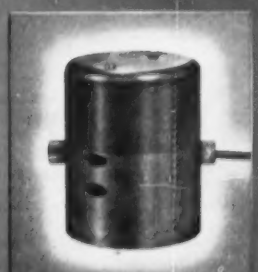
Shown here are a few of those Sheffield control units so widely used in automated systems.

AIRLECTRIC

A limit, type pneumatic control to actuate signals and relays.

LECTROLAIR

A sealed-in control to actuate signals and relays and also to give visual size indication.



DIFFERENTIAL

A gage head for checking taper, hole parallelism or hole center distance and converting the result into an actuating electrical impulse.

VARIATION

A pneumatic gage head for external or internal dimensions and face to axis runout—converts the result into an actuating electrical impulse.

See us at the Machine Tool Show, Booth 1305

For more detailed information, write for Bulletin AU-1154

The Sheffield Corporation
Division 1
Dayton 1, Ohio, U.S.A.

MANUFACTURE AND MEASUREMENT FOR MANKIND

SHEFFIELD HEADQUARTERS

SHEFFIELD

How MICROHONING Makes a Gas-Tight Running Seal Without Piston Rings

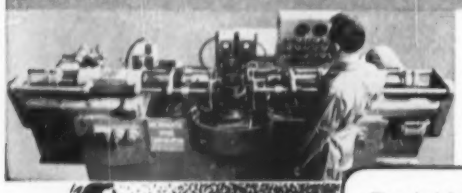
A leak-free, running seal between bores and pistons—without the use of rings—is possible only when the processing method generates diametric and geometric accuracy and the required functional surface finish. These characteristics are simultaneously obtained by the Microhoning process. Here's how:

1 The sticks of abrasives in the tool form an abrasive "cylinder" and are fed out radially with equal pressure in all directions. High spots and tight areas in the bore are abraded first.

2 The long abrasive sticks cut only on the crests of wavy or snaky surfaces until the bore has the same diameter throughout its full length.

3 The combination of tool motion (rotation and reciprocation) and feed pressure fractures the abrasive grits that have become dull, and new sharp edges are formed; the clean constant cutting action of every stroke on the full bore length consistently generates the desired surface finish.

One of the exclusive advantages of Microhoning is its ability to produce whatever functional surface characteristics are required for maximum product performance. Microhoning's cross-hatch pattern, with its myriad of minute intersecting "valleys," furnishes an excellent surface for retention of lubrication.



"Here's one of two Micromatic Model 523-2 machines used on the compressor crankcase job. Tecumseh uses a total of 18 Microhoning machines on other vital processing operations."

The principles and applications of Microhoning are thoroughly explained in an informative 16mm., 30-minute sound movie, "Progress in Precision." We'll be glad to reserve a print for your use. Just tell us on the coupon the date you'd like to see it.

☐ Please send me "Progress in Precision" in time for showing on _____ (date)

☐ Please send literature on Microhoning. I am interested in the following application: _____

NAME _____

TITLE _____

COMPANY _____

CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

mounted 24 x 48-in. stabilizer plate, faced with a 1-in. pad of sponge rubber. Plate hydraulically closes on the load from above; combination of ball mount and sponge-rubber pad compensates for uneven stacking. Clamp opens to max of 58 in. above lower forks, closes to min of 38 in.

Lamson Corp, Syracuse 1, NY

Low-temperature cabinet Model WE-2-140 is designed for testing of electronic components, metals, and thermal contraction and expansion fitting. 2-cu-ft unit offers –140 F temperatures, is available with top or front opening. Stainless-steel chamber dimensions are 22½ x 12 x 13 in.

Webber Engineering Corp, Dept SZ-287, PO Box 217, Indianapolis 6, Ind

Power-driven back gage, front-operated, is available as optional equipment on Niagara press brakes of 50- through 150-ton capacity. Gage makes possible quick, accurate settings without requiring operator to leave front of machine. Two push-buttons control movement of gage, both ends of which can be adjusted to the same setting at the same time or set independently.

Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY

Plastic packaging film is chemically inert and non-toxic and is said to have excellent resistance to boiling, moisture, and gas permeation. Film is heat sealable at 275 to 350 F. Tensile strength is greater than 15 lb per in. of width. Film is available in widths up to 22 in. and in lengths to order; it is 4½ mils thick.

Minnesota Mining & Mfg Co, 900 Fauquier St, St Paul 6, Minn

Electric blanket for heating conveyor heating chambers up to 600 C can be designed for conveyor belts of any length or width. Blankets are designed in a series of 4 to 8-ft lengths, and surround an expanded metal form through which conveyor belt and its work load pass.

Glas-Col Apparatus Co, Dept NR, 711 Hulman St, Terre Haute, Ind
1424X

File segments for use on filing machines are mitered, beveled, and half-lapped on the ends to join in such a way as to present the equal of a solid file to the work. An angular rather than a straight joint

between segments is produced, resulting in a smooth skew cut without bump or chatter. Bands are 5/16 in. in width, and supplement company's previously announced segments in other widths.

Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio

Cold-galvanizing compound called Drygalv is applied like paint, produces a coating with proportion of 95% metallic zinc in the dried film. Coating affords the same protection as galvanizing. Material is nontoxic, dries to the touch in 15 to 30 min, and will withstand temperatures to 392 F.

American Solder & Flux Co, 19th & Willard Sts, Philadelphia, Penna

Permacel 345 Degreaser is a concentrated, self-emulsifying fluid practical for a variety of applications. For most users it is cut with 8 parts kerosene or light fuel oil. Said to be free of toxic fumes, it is furnished in 1-qt and 1-gal cans, and 5-, 15-, and 55-gal drums.

Permacel Tape Corp, New Brunswick, NJ

Oil coolers for hydraulic systems are available as air or water types, are said to provide high rate of heat transfer per unit of space occupied. Series OCW (water) are furnished for oil flows up to 100 gpm and for continuous power removals up to 37 hp. Series OCA (air) are for flows up to 70 gpm for removals up to 13.2 hp.

Vickers Inc, Detroit 32, Mich

Universal test indicators, called Puppitast, incorporate contact points with threaded base to permit screwing into a rotating axis at tip of holder for rapid interchanging. Model A reads in 0.0005 in. with total range of 0.030 in.; Model B, 0.0001 in. for range of 0.010 in.

George Scherr Co, 200 Lafayette St, New York 13, NY

Automatic welding wire designated A-S-8620 is a chrome-nickel-molybdenum alloy with less than 2% total alloy content, is said to be "sympathetic" toward practically all low alloys. If the base metal is of higher carbon, carbon pickup from dilution in the weld metal reportedly gives excellent wearing resistance and

Why TECUMSEH Compressor Crankcases Are MICROHONED

"On Tecumseh compressors, we Microhone the piston bores. ***This gives us a running seal between pistons and bores which prevents gas leakage and eliminates the need for piston rings!*** Believe me, it takes a real combination of accuracy and functional surface finish to get results like that . . . and only Microhoning has given us that combination!"

(Tecumseh Products Company, Tecumseh, Michigan, is the world's largest producer of refrigeration compressors. Precision engineered and processed these units are hermetically sealed before leaving the factory.)

OTHER JOB DATA:

MATERIAL	Cast Iron
PRECEDING OPERATION	Diamond finish-bore
MICROHONING OPERATIONS	One
STOCK REMOVAL	.0007" to .001"
FINISH	10 Microinches
TOLERANCES	
Diametric	.0003"
Roundness	.00015"
Straightness (Taper)	.00015"
HONING CYCLE	18 seconds, including fixture indexing time

"Here's our twin cylinder crankcase. The two piston bores in each case are opposite one another in the vertical plane, but they lie in two different horizontal planes. We simultaneously Microhone both bores in each crankcase, using a horizontal type machine with two opposing spindles."

"Although all of our crankcases are similar in design, the bores vary in diameter — 1.312", 1.375", 1.500" and 1.625". Two fixtures on a two-position rotary indexing table let us Microhone one crankcase while another is being loaded. To run different bore diameters we just change the tools and gage rings. Switchover time is about five minutes."

Let a Micromatic Field Engineer show you how Microhoning will give you better functional finishes, closer tolerances and higher production.

☐ *Please have a Micromatic Field Engineer contact us.*
☐ *Please send literature and case histories on Microhoning.*

NAME_____

TITLE_____

COMPANY_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

it's a fact!
COLOR
gives your tools
greater sales appeal!
DIP SEAL
HOT MELT PLASTIC
PROTECTIVE COATINGS

DS-300 CLEAR GREEN
DS-300 CLEAR RED
DS-250 CLEAR
DS-260 AMBER
DS-600 (Jan-C-149 TYPE I)

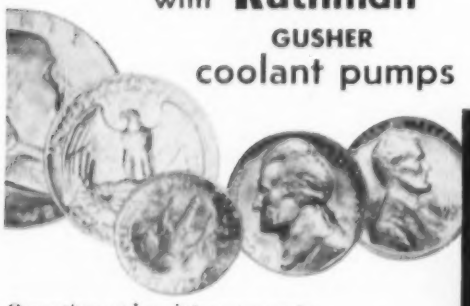
RETAINS TRUE COLORS

DIPPING TANKS ALSO AVAILABLE

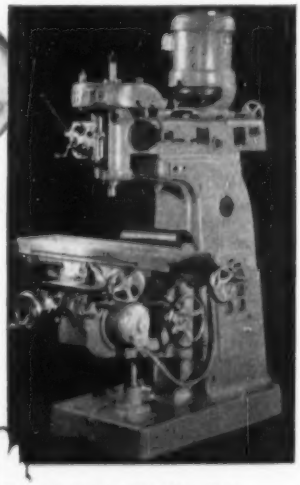
WRITE FOR OUR CATALOG

DIP SEAL PLASTICS, inc.
BOX 395 • ROCKFORD, ILL. • PHONE 5-8525

SAVE TIME and MONEY
with Ruthman
GUSHER
coolant pumps



This milling machine, manufactured by George Gorton Machine Company, is equipped with a Ruthman Gusher Coolant Pump in back of the column.



Operating and maintenance costs are reduced when you specify Gusher Coolant Pumps. You get split-second coolant flow . . . controllable as to volume. There is no priming or packing needed. Heavy-duty pre-lubricated ball bearings and electronically-balanced rotating shaft give you long life with minimum cost of maintenance. We will be glad to advise you on your coolant problems.

Model S-P 3

THE RUTHMAN MACHINERY CO.
1818 Reading Road
Cincinnati, Ohio

NEW SHOP EQUIPMENT

high elongation qualities to prevent cracking and spalling.

American Chain & Cable Co, 929 Connecticut Ave, Bridgeport 2, Conn

Silver brazing alloy is available in expanded-and-rolled strip form; principal advantage is weight reduction. Expanded strips up to 12 in. wide in precision thicknesses down to 0.003 in. can be supplied. Any of the Easy-Flo and other brazing alloys normally supplied in strip form is available in expanded form.

Handy & Harman, 82 Fulton St, New York 38, NY

Plain ring gages in previously announced Boremaster series are now available in cabinet sets. Three standard sets are offered in ranges running from ½ through 3 in. Sets in other ranges may be specially ordered. In each case, gages are graduated in increments of 1/64 in.

Size Control Co, 2500 W Washington Blvd, Chicago 12, Ill.

String buffs for polishing operations are available as cotton-string section wheels, cotton-string cup bobs, or goblet buffs, and are offered in a standard selection of the most popular sizes. Buffs can also be made to customer's specifications. Maker stresses that buffs contain only virgin, long-fiber cotton, with no reprocessed or waste yarn used.

Schlegel Mfg Co, Div P-4, Rochester 7, NY

Magnetic cylinder square simplifies problems connected with checking of squareness, provides 360° squareness in a matter of seconds. Device consists of a 3½-in.-dia flat disk connected to a 6-in.-long cylinder. Magnets hold disk against surface to be checked; attached cylinder is then checked with height gage to determine squareness of piece being checked. Device is also available in a model 7½ in. in dia and 14 in. long.

4A Gage Co, 551 Fair St, Detroit 20, Mich

Nylon pipe called Tempertube can be supplied in straight lengths or continuous coils in sizes from ⅜ to 1½-in. OD with wall thickness from 0.025 to 0.125 in. Maker reports that pipe will not soften up to 225 F, has high tensile strength, and good weather resistance. Pipe is 1/3 the weight of aluminum.

Danielson Mfg Co., Danielson, Conn

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

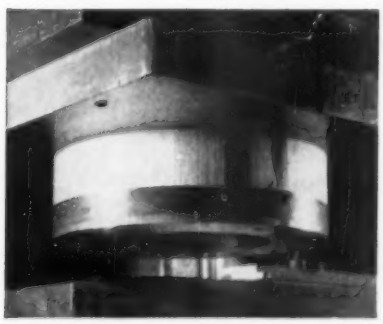
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

Good Results with BTR Hollow-Bar in Manufacture of Fan Housing

Based upon all-around performance — less time spent in machining, good resistance to wear, and ease of heat-treatment — dies of BTR (Bethlehem Tool Room) Hollow-Bar rang the bell recently at Electrolux Corp., Old Greenwich, Conn.; the steel was supplied by Lindquist Steels, Inc., Bridgeport, Conn.

The dies, hardened to approximately Rockwell C 60, and operating in a 100-ton press, formed fan housings from 25-gage zinc-coated sheet steel at the rate of more than 1600 pieces per hour. Redressing was required once every two months or so, and then no more than 0.010 in. was removed.



BTR Hollow-Bar is made from our oil-hardening tool steel by a process called high-speed trepanning. By this method, we take hammer-forged round bars, core the inside diameter, then give them a rough-turning on the outside.

With BTR Hollow-Bar there's no need to run up shop costs waiting for delivery of forged rings or discs. Instead, this fine tool steel comes to you ready to go, with no need for drilling, rough-boring, rough-facing or rough-turning.

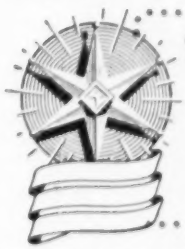
Your Bethlehem tool-steel distributor will be glad to explain how BTR Hollow-Bar can be of real service to you. Or a phone call or letter to the nearest Bethlehem sales office will bring you detailed information promptly.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Remove all the "Bark" from Liquid-Quenched Tools

Most users of tool steel realize that it is necessary to remove the "bark" (scaled and decarburized outer surface) from tool-steel bars in order to obtain full, uniform hardness in heat-treatment. If this area is not removed, low hardness will result because of the low carbon content of the decarburized metal. It is not always recognized that this procedure is necessary on tools which are to be liquid quenched, even though portions of the tool do not constitute working surfaces.

If tools are to be liquid quenched, all the bark must be removed to avoid excessively high quenching stresses which could cause cracking of tools during hardening. Low carbon areas on the surface transform during hardening at a different time than the higher carbon interior. This sets up additional stress which, added to the high thermal stresses from quenching, could cause cracking. Air-hardened tools can tolerate bark on non-working areas because of the low hardening stresses in air hardening. But with liquid-quenched tools there are no exceptions — remove all the bark.

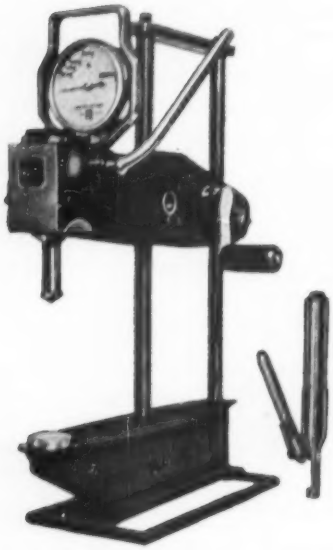


TOOL STEEL MOVIE WINS ANOTHER AWARD

"Teamwork," Bethlehem's new motion picture on tool steel, received a second film award, a silver reel symbolic of excellence, at the recent American Film Assembly competition in Chicago.

The 16-mm, 30-minute color film explains the manufacture, quality control and heat-treatment of Bethlehem tool steels. It is available for showings to machinists, heat-treaters, die makers and tool manufacturers. To see the film, write to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

Make Accurate Brinell Tests Anywhere!



KING PORTABLE BRINELL HARDNESS TESTERS are used the world over where ease of operation, dependability, guaranteed accuracy are essential.

- make tests in any position, anywhere — even in small, cramped spaces other testers cannot reach
- test parts of any size with removable test head—a King exclusive
- get accurate results every time—full 3000 kg load on 10 mm ball gives clear, sharp impression

Write for complete specifications, prices on full range of models and adapters.

KING
TESTER
CORPORATION
13th & BUTTONWOOD STS.
PHILADELPHIA 23, PA.

NEW SHOP EQUIPMENT

Soluble cutting fluid for heavy-duty work and general machine-shop operations, Purosol HD, contains an extreme pressure additive that reportedly permits it to be used as a satisfactory replacement for many types of higher-priced sulfurized cutting fluids. Said to have exceptional emulsion stability, fluid protects against rust and gumming.

Pure Oil Co, Industrial Marketing Dept, 35 E Wacker Dr, Chicago 1, Ill

Bendable tubing known as Plica has a three-ply wall and can be made in almost any desired combination of ferrous and non-ferrous metals, fiber, paper, and other materials. Tubing is made by automatic machines in continuous lengths, has high wall strength, water tightness and sharp bending radii. Tubing can be used for such things as electrical conduits, coolant and lubrication lines, hot and cold air ducts, and flexible shaft casings. Size range is ⅜ through 2-in ID. Bulletin 61.

Wendt-Sonis Co, PO Box 867, Hannibal, NY

Roller turner tool with throw-away carbide inserts, Style WSM, provides means by which inserts can be indexed within ±0.001 in. without resetting holder. For easier initial setting a screw in the top of the holder adjusts the cutting edge to work centerline. Separate carbide chip breaker is adjusted in seconds after holder is clamped in the roller turner. All holders, which are made for Warner & Swasey or Gisholt roller turners, can be used with or without chip breakers.

Wendt-Sonis Co, PO Box 867, Hannibal, Mo

Carbide-tipped saws, called Meyco Mainline Uni-Chip, have alternating double-beveled and straight raker teeth, for long life in cutting teeth and smooth chip-cleaning with raker teeth. Saws come in several diameters and with different numbers of teeth, can be used for cutting nonferrous metals, plastics, and other abrasive materials, as well as wood.

W F Meyers Co, Inc, Bedford, Ind

Tachometer for rotating machinery. Model 5 Wac-Tac, has very thin pancake design which provides a minimum of protrusion beyond machine to which it is attached. Device delivers an ac voltage whose fre-

New King Brinell Microscope

Gives Fast, Accurate Readings

New improved design for reading Brinell impressions where other microscopes cannot reach.

Small nose gets into corners, holes, behind shoulders . . . requires less grinding on castings, billets, die blanks . . . fits flush over impressions —even on curved surfaces.

Compact, lightweight stainless steel construction. The King deep-reading microscope requires no adjustment to the eye, uses finest available lenses and built-in illumination for accurate readings.

Offset model with tapered nose reads impressions on inside surface of pipes and tubes.

Write for illustrated bulletin and specifications.

KING
TESTER
CORPORATION
13th & BUTTONWOOD STS.
PHILADELPHIA 23, PA.

KEEP IT CLEAN...

by Phil Tration

ELECTRO-STAYNEW MIST COLLECTOR

To say that *every* pipe line needs a Dollinger Filter is certainly an exaggeration. However, nearly all air-operated tools, instruments, controls, and industrial processes must be protected from destructive dirt, dust, pipe scale, and condensates . . . and nothing does this job better than a Dollinger Pipe Line Filter.

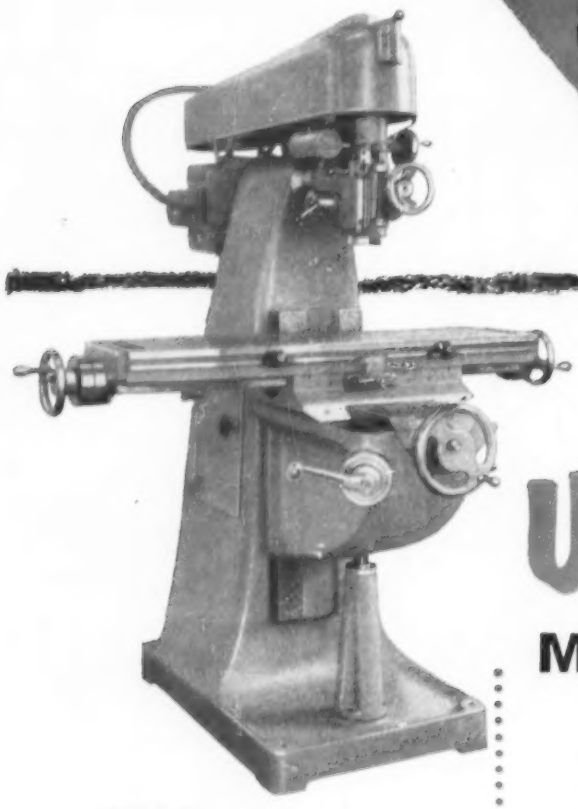
Also, to assure clean air in machine shops, Dollinger makes the *Electro-Staynew Mist Collector* illustrated at the right. It provides a self-contained ventilating system for individual machine tools. Removes oil, smoke, grit, and chips from the air, and returns clean air to shop. Saves you hundreds of dollars in building maintenance alone. Also, reduces employee sickness.

Whatever your filtration problems, why not talk them over with a Dollinger engineer . . . call today, or write for Bulletin 420 which fully describes the Mist Collector. Dollinger Corporation, 93 Centre Park, Rochester 3, N. Y.

DOLLINGER
STAYNEW FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
ELECTROSTATIC FILTERS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS
VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS
AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Choice of hand or
power feed head and table



BALANCED RIGIDITY

assures
*CERTIFIED
ACCURACY

in the NEW

U.S.Vertical
MILLING MACHINE

Balanced rigidity, the key to accuracy for vertical and angular milling operations, is an integral part of the new U. S. Vertical Milling Machine.

These U. S. Vertical features provide rigidity for close tolerance work:

- Machine weighs 2000 pounds
- Extra wide bearing surfaces
- Motor mounted behind column, balances weight of head, resists vibration and deflection
- Major castings are internally ribbed, normalized, stress relieved, and internally braced
- Dovetails are deep and hand scraped
- Massive knee, saddle and table

Drive by B section V belt

***Tested 10 Ways!**

The accuracy of each U. S. Vertical Milling Machine is certified. A check sheet accompanies every machine listing 10 exacting operational tests the machine has passed. The check shows allowable tolerances and actual measured tolerances of the individual unit. A new bulletin provides complete specifications and illustrates various accessories available on the new U. S. Vertical Milling Machine. Write for your *FREE* copy today.

U·S·Burke
MACHINE TOOL DIVISION

6 Brotherton Road
Cincinnati 27, Ohio

Manufacturers of:
Burke Bench Mills, U. S. No. 1 Milling Machine and the radically new U. S. Quartet

quency and magnitude are linear with speed, making design useful for controls sensitive to either frequency or voltage. Generator sinusoidal voltage may be as high as 25 v per 100 rpm, and frequency is 30 cps. No slip-rings, brushes, or contacts are employed.

Wac Engineering Co, 35 S St Clair St, Dayton 2, Ohio

Transparent layout tape of two-ply construction has symbols printed on top of lower of two layers, so that printing is protected from contact at all times. Pressure-sensitive tape requires no backing strip, is ready for use upon being stripped from roll. More than 80 symbols are available. Booklet on tape is offered.

Labelon Tape Co, Inc, 450 Atlantic Ave, Rochester 9, NY

Ratchet wrench called Swagelok is of one-piece, open-end design and is intended for use with ¼- and ⅜-in. tube fittings. Tool automatically equalizes torque over five corners of hexagon nut, increasing strength and insuring sure grip. Rollers are made of special alloy steel.

Crawford Fitting Co, 884 E 140th St, Cleveland 10, Ohio

Chromium plating additive, designated CPA 1800, is designed for both decorative and hard-chromeplating applications. By replacing a portion of the sulfate used in conventional chromeplating solutions, material is reported to speed up and simplify operations. Additive is packed in 5-lb cans.

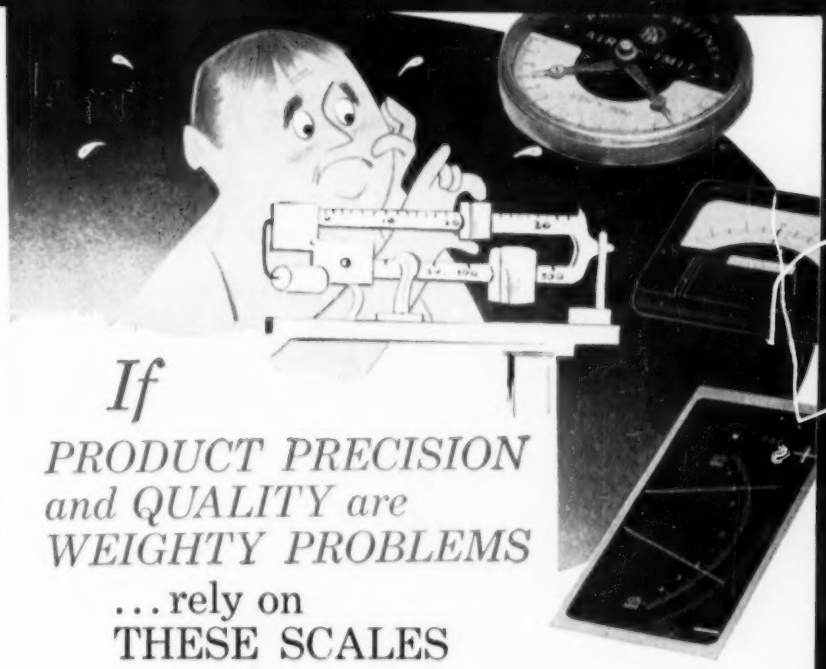
Diamond Alkali Co, 300 Union Commerce Bldg, Cleveland 14, Ohio

Stop-nut with resilient, black, nonmetallic collar is available in steel, aluminum, brass, and stainless steel. Collar is said to provide a positive locking action of the nut in any position on the screw, whether seated or not. Nut can be re-used many times.

Jacobson Nut Mfg Corp, Box 177, Kenilworth, NJ

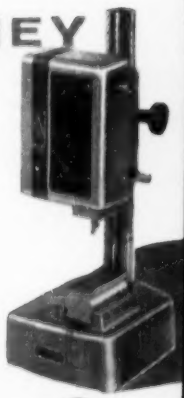
Diamond hand files can be used to dress or sharpen tools and dies on the machine, without removing tools. Files can also be used anywhere a conventional hone is used. Tools are available in six shapes for use on such varied materials as carbides, ceramics, quartz, sapphire, and titanium.

Starlite Industries, Inc, 58th at Market St, Philadelphia 39, Penna



If
PRODUCT PRECISION and QUALITY are WEIGHTY PROBLEMS
... rely on
THESE SCALES

PRATT & WHITNEY
BENCH COMPARATORS



P & W SIGMATIC COMPARATORS
Inexpensive high precision. Require no outside power source. Combine the simplicity of mechanical operation with high magnification (to 5000X). Easily portable. For external gaging applications.

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Extremely versatile -- use a large variety of gaging internal and external attachments to check a wide range of products. Readily engineered to meet *your* special requirements.

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DO IT BETTER — QUICKER — AT LESS COST

WITH Atrax SOLID CARBIDE

STANDARDS!

Atrax stock tools eliminate the waste & worry of "specials" 99 times out of 100!

All of the standards in the Atrax line were once "specials" —engineered and built to meet specific production demands. When the Atrax requirements of performance and dependability were proved, these tools were stocked as standards at standard prices—and are now available without delay, to meet virtually all metalworking needs. Whenever you're faced with a tough job, consult the Atrax catalog listing over 1000 standard tools before you order a "special". A production-proved tool to do the job—and do it right—is undoubtedly in stock. Always specify Atrax, you can't get a better tool—you can't get better performance.

Eliminate the cost and delay of "specials" —send today for the Atrax catalog illustrating more than 1000 solid carbide tools to do 99% of all metalworking jobs!

Atrax

THE ATRAX COMPANY

Newington 11, Conn.

Free Literature

To order any of these bulletins, please use cards at start of this section—page 180e.

MACHINES AND ATTACHMENTS

34 AUTOMATIC INJECTION MOLDING MACHINE—*F J Stokes Corp, Philadelphia 20, Penna.* 8-page bulletin 565 illustrates and describes design features of Model 701, a 2-oz unit. Complete sequence of ejection and degating pictured as well as automatic sorting. Specifications included.

35 VERTICAL BORING & TURNING MILL—*A Roller Maschinenfabrik, Berlin N 20, Germany.* 6-page catalog covers Model E 85; construction features illustrated. Diameter of face-plate, 33-5/64 in.; max turning height above face-plate, 31½ in.; 12 face-plate speeds; 8 horizontal and vertical feeds per revolution; max weight of workpiece, 2645 lb.

36 POWER PRESSES—*Zeh & Hahnemann Co, Newark 5, NJ.* Catalog describes line of standard, high production power percussion presses. Variety of models pictured; specifications and capacities in tabular form.

TOOLS AND ACCESSORIES

37 PRECISION GRINDING WHEELS —*Electro Refractories & Abrasives Corp, Buffalo 2, NY.* 4-page illustrated bulletin GP-56 covers new developments in wheels for centerless, surface, internal, and cylindrical grinding.

38 DIE SET LUBRICATION GUN—*Danly Machine Specialties, Chicago 50, Ill.* Illustrated catalog page gives data on unit for use with oil or grease.

39 CARBIDE TOOLS—*Schmarje Tool Co, Muscatine, Iowa.* Illustrated catalog contains descriptions, specifications, and prices for line of reamers, end mills, counterbores, and other carbide tools.

40 MINIATURE PROTECTED THERMOCOUPLES—*Thermo Electric Co, Saddle Brook, NJ.* 14-page bulletin 5 contains illustrated data on line designed especially for use in highly corrosive gases and liquids. Lists calibrations and temperature ranges available, immersion lengths, types and materials of mounting bushings.

41 GREASES—*Sun Oil Co, Philadelphia 3, Penna.* Technical bulletin 46 describes Sun C-891T designed to adhere under extreme conditions of dirt, moisture, low speeds, and high loads. Bulletin 47 gives data on Sun N-52X, a stable, high-melt-point product for bearings running at temperatures up to 250 F, or for sealed antifriction bearings used at normal temps.

42 TESTING INSTRUMENTS—*Custom Scientific Instruments, Inc, Kearny, NJ.* 8-page catalog CS-56 contains brief, illustrated descriptions of precision checking instruments for testing plastics, insulation, extensometers, dial indicators, light metals.

43 ONE-SHOT LUBRICATORS—*Bijur Lubricating Corp, Rochelle Park, NJ.* 2-page illustrated service instruction sheet gives operating information on high capacity spring discharge piston pump lubricators, Type D, for machines requiring closely controlled but infrequent oil service. Similar sheet covers Type KI built-in lubricator for centralized oiling of table and cross-feed ways of milling machines, grinders, and similar equipment.

44 LARGE DIAMETER GAGES—*Boice Gages, Inc, Staatsburg, NY.* Revised edition of engineering manual "Green Design Book" contains drawings of all models of the Boice line of indicator gages. Applications and dimensions included.

Announcing VK MICROGAGES

.000008" ACCURACY

81-BLOCK SET
$250.00

30% *more wear surface than rectangular blocks*

Two really new and important facts should be noted in this announcement by Van Keuren: the closer tolerance of ± .000008" on VK Microgages, and the 81-block combination of ⅞" diameter longer-wear gages . . . now available for the first time.

These fine quality precision gage blocks by Van Keuren are products of the same machine-lapping and inspection techniques as Van Keuren Rectangular and Solid Square gage blocks. Size tolerance as already noted is guaranteed, as well as a maximum surface roughness of 1.4 RMS. Because their round shape provides greater wear surface, Van Keuren Microgages can be depended on for longer life and lower cost. Their closer tolerance has been particularly developed to meet today's demands for more exacting precision in shop work.

In addition to the new 81-block closer tolerance set featured here, Van Keuren offers 15 other standard sets of Microgages; also Solid Square type sets of gage blocks in .000004" accuracy and Rectangular type sets in .000004" and .000008" accuracy. For further information address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

37th YEAR

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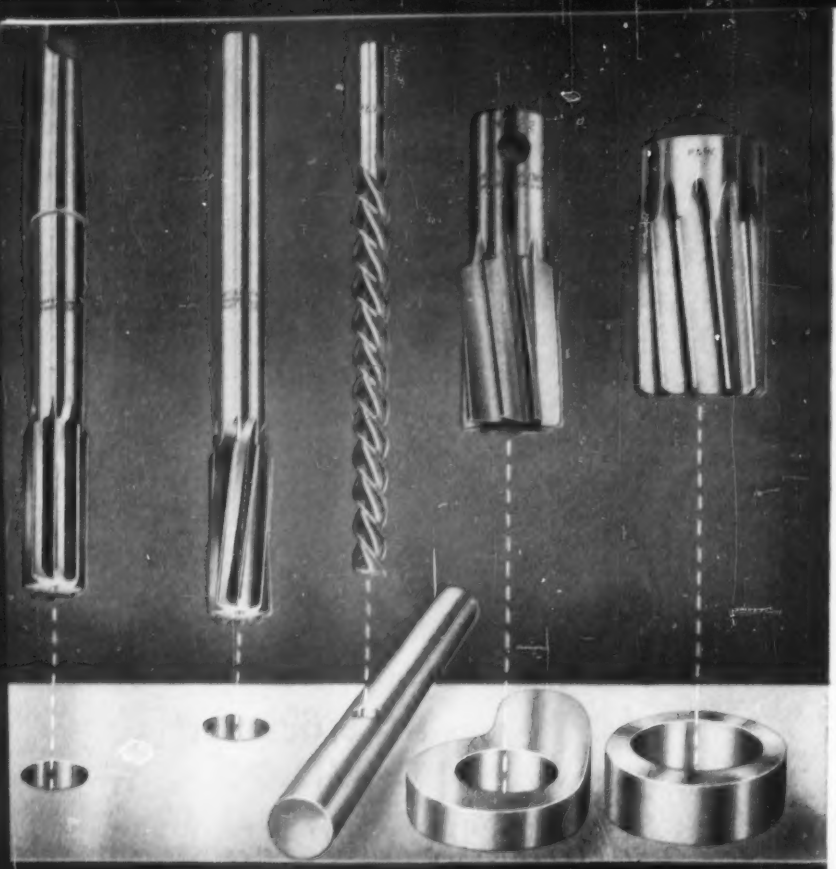

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Quality REAMERS

for the long run . . .

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When you buy reamers, you're *really* buying the number of smooth, round, accurate holes each tool will produce. That's why Pratt & Whitney Reamers – cutting smoother, faster and longer – are your best buy in the long run. From the start (with selected steels and proved-correct design) . . . to the finish (the distinctive P&W special surface treatment) . . . they're quality *all the way!*

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MACHINE TOOLS • GAGES • CUTTING TOOLS

Free Literature

HEAT TREATING AND WELDING

45 FILLER ROD—*Ampco Metal, Inc, Milwaukee 46, Wis.* Bulletin W-31 describes Ampco-Braz No. 1, a low-fuming, high-strength, nickel-brass rod for brazing and brazewelding with oxy-acetylene process. Characteristics, mechanical properties, applications, sizes covered.

46 METALLIC POWDER CUTTING EQUIPMENT—*Air Reduction Sales Co, Div of Air Reduction Co, New York 17, NY.* 4-page illustrated folder, Form ADC 839A, describes line of equipment for cutting and washing stainless steels, other high alloy steels, and cast iron. Vibratory and pneumatic type powder feeders discussed, as well as hand and machine torches.

PLANT SERVICE EQUIPMENT

47 FORK TRUCKS—*Clark Equipment Co, Industrial Truck Div, Battle Creek, Mich.* 16-page brochure, "Clarklift Features," gives construction details, operating characteristics, and maintenance data on new six-model line.

48 ELECTRONIC AIR CLEANERS—*Trion, Inc, McKees Rocks, Penna.* 8-page catalog E-40 describes packaged models built into the return air duct of heating or air conditioning systems. Units are said to remove practically all air-borne dirt, soot, pollen, and other particles.

49 PLATING TEST EQUIPMENT—*R O Hull & Co, Rocky River 16, Ohio.* 8-page brochure discusses Roheo equipment for plating baths. Complete line of instruments and accessories for plating tank testing described.

50 PALLET-TYPE STEEL BOXES—*Hamlin Metal Products Co, Akron 12, Ohio.* 8-page booklet presents illustrated information on Hamlintainers, made of lightweight alloy steel; can be set up or folded flat in less than 20 seconds. Can be used with any forklift, has load capacity of 5000 lb.

51 BARREL FINISHING — *Speed-D-Burr Corp, Glendale, Calif.* Illustrated catalogs give details on variety of units available for high production or short runs, for large, small, or intricate parts. Data on media and compounds available.

52 NICKEL PLATING PROCESS — *Sel-Rex Precious Metals, Inc, Belleville, NJ.* 10-page technical paper describes compressively stressed nickel undercoating for rhodium. Covers plating solution composition and operating conditions, make-up and control of Lectro-Nic solutions, analysis and properties.

PARTS AND MATERIALS

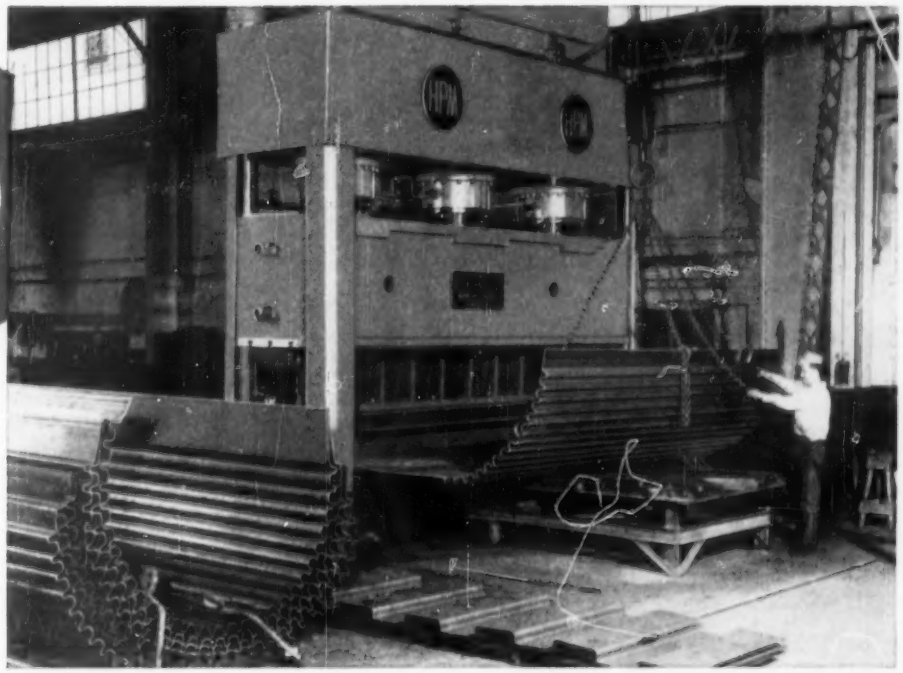
53 UNIFIED THREADS — *Cleveland Cap Screw Co, Cleveland 4, Ohio.* 4-page illustrated folder cites profile origins of the Unified Threads adopted in 1948 by the US, Britain, and Canada; the minor changes in threads per inch from American Standards; advantages of thread tightness and interchangeability.

54 AIR CONTROL VALVES—*Airmatic Valve, Inc, Cleveland 9, Ohio.* 72-page catalog illustrates line of 2-way, 3-way, and 4-way valves for high or low pressure installations. Features, application data, dimensions included.

55 "FACTORS TO CONSIDER ABOUT TOOL STEEL"—*Heat Treating Div, Wiedemann Machine Co, Philadelphia 32, Penna.* 4-page booklet discusses problem of uncompensated shrinkage or expansion caused by heat treating. Outlines steps to be taken to eliminate difficulties; charts tabulate tempering temperatures necessary to obtain specific Rockwell hardness.

Permanent Wave for ½" Plate

PLATE SHOWN ACTUAL SIZE



Special H-P-M Press Corrugates Heavy Steel Plate Annealing Boxes

For rugged, heavy duty jobs—special metal forming requirements of all types—manufacturers like National Annealing Box Co., Washington, Pa., rely on H-P-Ms. This special frame, long bed, 1500 ton H-P-M will handle steel plate up to 180" wide. Half inch plate (as illustrated) is formed into cylindrical or flat corrugated sheets which form the walls and covers of annealing boxes. These corrugations are 2" deep, well rounded for strength, formed one at a time.

For your toughest jobs choose H-P-Ms—standard and special Fastraverse, self-contained presses are easily adapted to countless applications. Call your H-P-M field engineer at the planning stage. Here's worthwhile experience for you!

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HPM

THE HYDRAULIC PRESS MFG. CO.

Mount Gilead, Ohio, U.S.A.

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Whether you're a production man, plant engineer, designer of original equipment, or a manufacturer looking for ways to reduce costs and overhead—there's a way that real savings can be built into machinery used in your industry!

Reduced down-time and repair bills . . . longer machine life . . . increased production . . . elimination of costly hand oiling, and product spoilage due to over-lubrication are only a few of the benefits derived when a Bijur System becomes your "silent partner." Every bearing gets just the *right* amount of clean oil at the *right* time . . . automatically, while the machine is running.

Learn how inexpensive it is to start saving—the Bijur way. Write today for all the facts!

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LUBRICATING CORPORATION
Rochelle Park, New Jersey
Pioneers in Automatic Lubrication

Free Literature

56 "TITANIUM CARBIDE PRODUCTS PRODUCED BY THE INFILTRATION TECHNIQUE" — *Sintercast Corp, Yonkers, NY.* Technical reprint discusses process said to permit production of void free bodies of remarkably true shape and close dimenional tolerances, allowing fabrication of products that will have excellent high temp strength properties above 1600 F.

ROUND TABLE Discussion

OFF AGAIN, ON AGAIN

What should be done about a worker who resigns from his job, and later wants to take back the resignation? Should there be a hard-and-fast rule that such a man cannot be considered for "re-instatement"?

An experienced man is a valuable asset to a company. It takes a long time to train a man to the ways of the organization so that he thinks and functions as part of the team. Materials, tools, machines, and supplies are standardized to a high degree and in general they are replaceable. Occasionally it will take considerable time to rebuild or replace a machine, but it takes years and years to build up a smooth working, profitable organization.

In many cases it is the irreplaceable team of trained leaders that is a company's most valuable asset. There are many investment analysts who base their ratings and recommendations on the quality of leadership and managerial ability in the company. The possession of a better team is the usual reason why one company can grow faster than the others in the same field.

If a company suffers a fire or flood and loses the records and files and drawings, a well trained, experienced staff can keep them going and make a comeback. The know-how and ability of the company is not something that is stored away in the files; it is in the people.

When a man resigns the company can take a short-sighted view point and tell him to go ahead and quit. They can assume an artificial attitude of independence and can tell themselves that they never needed him anyway. They may even take his leaving as a personal insult and, as a defense, tell him they are glad to see him go.

The practical-minded employer who can see the true picture knows how valuable his staff is to him. He knows how to run the organization; he knows how to control his group and get them to work with him. He knows how long it takes to train a man and, therefore, he will make every effort to have an experienced man stay on. The employer should accept the cancellation of the resignation and take the man back without question.

In general, when a man submits his resignation it is a good idea to make the necessary plans to re-arrange the staff, but it can and should be done in secret. There is no need to tell anyone ahead of time just what changes are contemplated. In this way it makes it easy for all concerned if the man who resigned changes his mind, or if the company persuades him to stay on. In addition, if the resignation is kept secret it makes it easier for a man who resigned to change his mind.

Henry George
Bronx, N Y

Ed crawled out on a limb of his own special choosing, and then sawed it off and himself with it. Which is just another way of saying that he made his own bed and now has to lie in it.

It is a cardinal rule in this world and in industry that when a vacancy is expected to occur, you don't notify the stepper-upper until there is a

"Ah, Hully Gee, it's me hobby—I collect scrap metal—"

Caterpillar Chooses WILLIAMS-WHITE Presses

DW15 Tractor with No. 15 Scraper and D8 Tractor at suburban housing project, Tulsa, Oklahoma.

All WILLIAMS-WHITE *machines are custom-built to meet your individual needs*

The press illustrated at right is one of the new WILLIAMS-WHITE machines installed in the Caterpillar Tractor Co. plant in Decatur, Illinois.

It is essentially a straightening press but the wide table, 90" by 54", makes it a versatile tool for other operations.

In choosing these presses, Caterpillar takes advantage of WILLIAMS-WHITE & CO.'s 102 years of machinery building experience.

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Wynnewood, Philadelphia, Pennsylvania

GEORGE A. DAVIES, JR. MACHINERY CO.
Los Angeles, California

The press above is typical of machines built to specification by WILLIAMS-WHITE & CO. If you have need of such equipment, we will be pleased to receive your inquiry. Our staff of engineers and designers is at your service, without obligation.

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PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

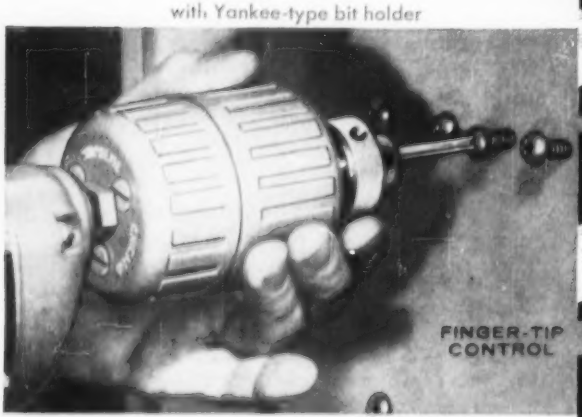
Greatest new tool in years for maintenance and production

a high quality, low cost
REVERSIBLE
SPEED REDUCER

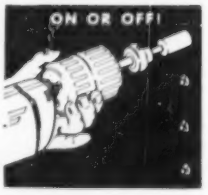
Fits all portable drills . . . reduces speed, increases torque seven times. Ask your distributors to show you the . . .

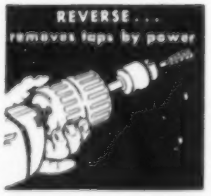
Supreme Versamatic

PROFESSIONAL MODEL
No. 4000-P
with Yankee-type bit holder



COMPLETE 14-PIECE SET . . . ONLY $24.95





Engineered and manufactured by the makers of

Supreme Chucks
BRAND

The line that's UP FRONT on America's leading power tools

SUPREME PRODUCTS CORP., 2222 S. CALUMET, CHICAGO, ILLINOIS

platform for the stepper-upper to step on. Sure, you select your man, and sometimes you even groom him for the job, but you don't promise him anything. You can't really promise anything, because no vacancy exists yet. You can speak to him about advancement generally, and eventually you can try to get him to study and prepare himself for future promotion, but you can't promise him what you don't have to give. You can dangle a piece of candy in front of him, and say, "There's a swell piece of something some lucky guy is going to get," but you logically can't promise it to him, and you shouldn't.

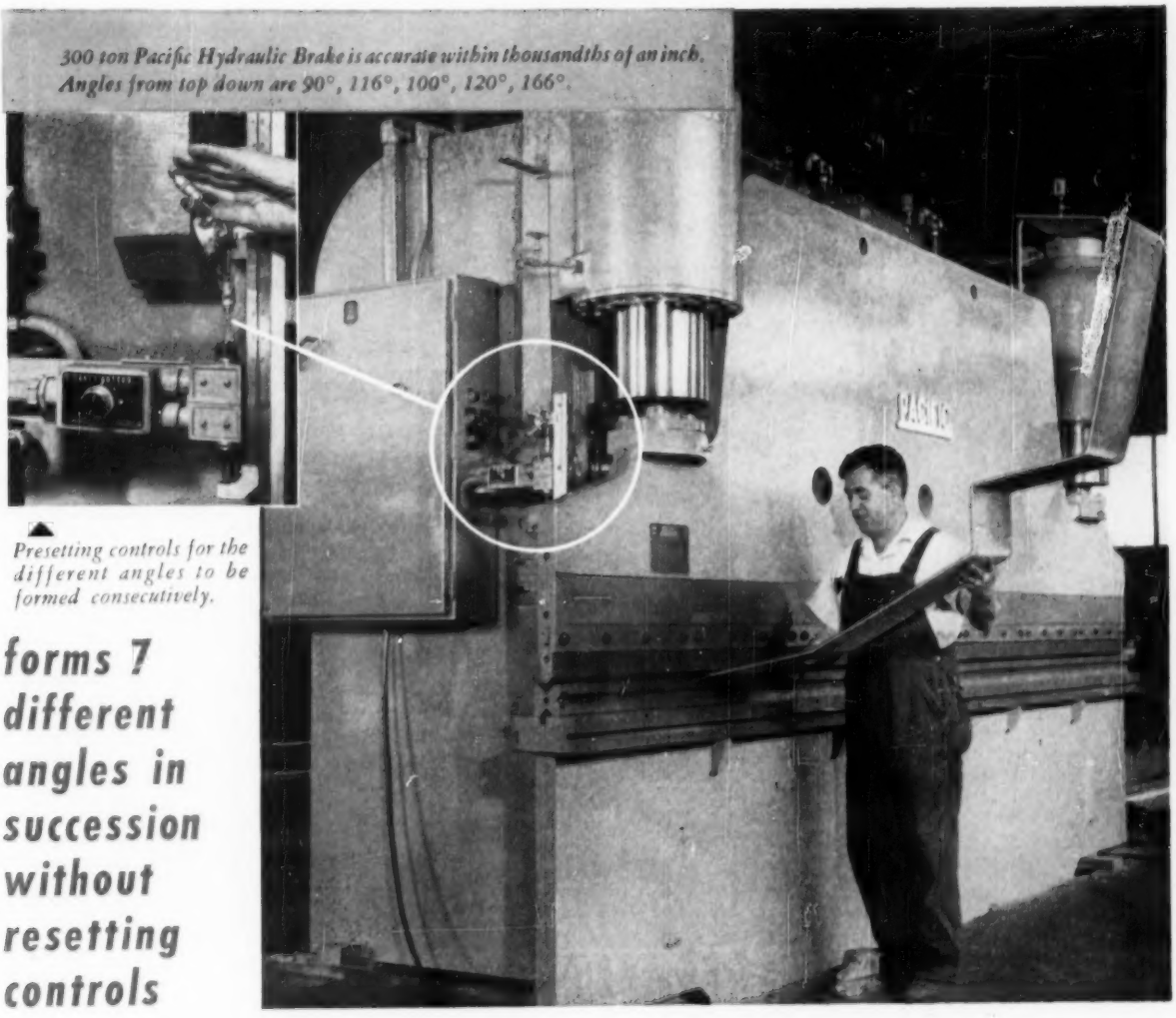
A few years back, I selected a man to be an assistant foreman on a rather complicated class of work in a toolroom. My man had demonstrated that he could do this work excellently himself. There was a big question in my mind whether he had the tact and understanding to teach his art to some fifteen men.

I thought it was worth a chance, but I made the mistake of promising my man the job, and a raise. I promised something I couldn't deliver.

When I took the matter up with my superior, I found out that he wasn't just a rubber stamp. He doubted greatly whether the man could deliver the goods we desired. He did agree to let me try the man out under these conditions:

1. I was to give my man a 30-day conditional tryout.
2. He would have the status of acting assistant-foreman.
3. There would be no notice on the bulletin board, no raise in pay, nor special privileges until the end of the 30-day period.
4. If the man made good, he got

300 ton Pacific Hydraulic Brake is accurate within thousandths of an inch. Angles from top down are 90°, 116°, 100°, 120°, 166°.



Presetting controls for the different angles to be formed consecutively.

forms 7 different angles in succession without resetting controls

PACIFIC HYDRAULIC PRESS BRAKE

In a single handling of metal, Pacific Hydraulic Press Brake forms an entire series of different bends. You set the controls just once and run through the entire sheet or plate. Handling time is cut to a minimum. Operating on the "air bending" principle, the ram comes down to a different depth with each stroke forming the various angles preset on the controls. Each bend is accurate within thousandths of an inch. The length of stroke can be adjusted to match any job; bends up to 12" deep can be formed in a single stroke while the stroke can be reduced to less than 1/8" and the press will cycle 50 strokes per minute or more.

The ram is held level automatically by patented controls so that work can be done at any point along the entire length of bed. Thus a piece can be passed progressively from die to die for blanking, deep drawing, embossing, punching and forming. In punching, continuous power drives the punch through heavy plate with the shock being absorbed by the hydraulic cushioning of the cylinders. This Pacific Hydraulic Brake is also used for straightening, rubber pad forming, pipe making, stretching, extruding, hot forming and even shearing heavy plates. The Pacific cannot be jammed or overloaded and its precise accuracy is maintained indefinitely. Maintenance is low.

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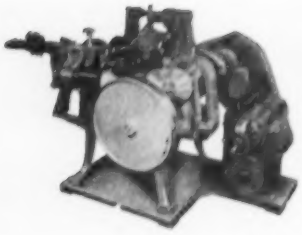
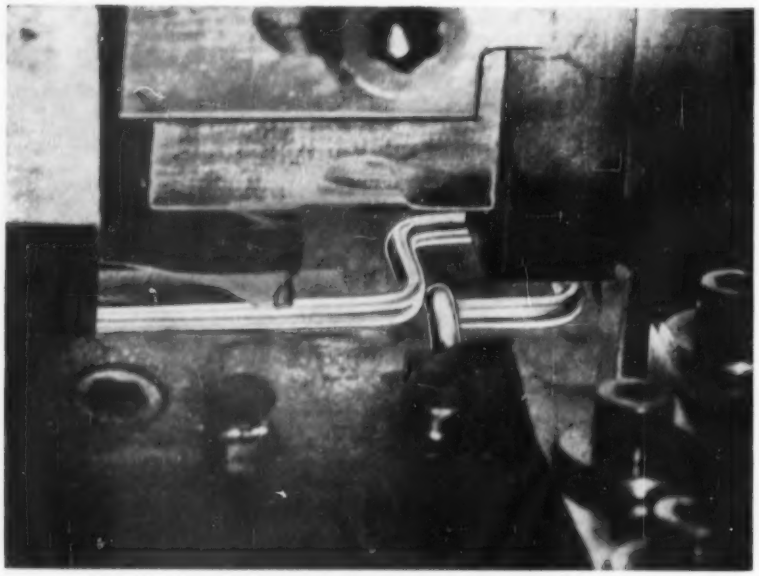


NILSON 4-SLIDES PAY OFF 4 WAYS

• BIG PROFITS • BIG PRODUCTION
• BIG SAVINGS • BIG GAIN IN ACCURACY



Forming Operation: Meter Shunts of 3/16" Wire Stock

WHY NILSON IS TOPS FOR 4-SLIDES:

Nilson 4-Slides are built for rugged duty
Form both ribbon metal and wire stock
Press capacities 8 to 75 tons, wire diameter to ½"

16 Models Available, Including Combinations of Horizontal Press and 4-Slide

YOU PROFIT BY: Automatic Operation • Increased Production • No Secondary Handling • Improved Products • Fewer Rejects • Lowest Initial Cost

Nilson engineers are always available for consultation on forming problems. Bulletin #61 sent on request.

Nilson's 3 tilt and 3 stationary reels handle wire or ribbon stock coils up to 500 pounds.

A.H. NILSON MACHINE COMPANY

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Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

that raise and a definite appointment to the job.

"They don't pay off at the start of a horserace," announced my boss; "the prize goes to the winner."

In the meantime, my man had had time to consider the glories of the proposed job. He candidly announced to me *HIS* terms.

1. A raise immediately.
2. Immediate change from his status of day worker to the sacred halls of the salaried class.
3. Immediate accession to vacation privileges with pay—instead of after a year's tenure of office—as was then the custom.
4. A notice on the bulletin board announcing his new status as foreman of toolroom milling machines, instead of as ass't foreman of the toolroom.
5. An office for himself with a new desk, chair and filing cabinet.
6. A new locker for himself.

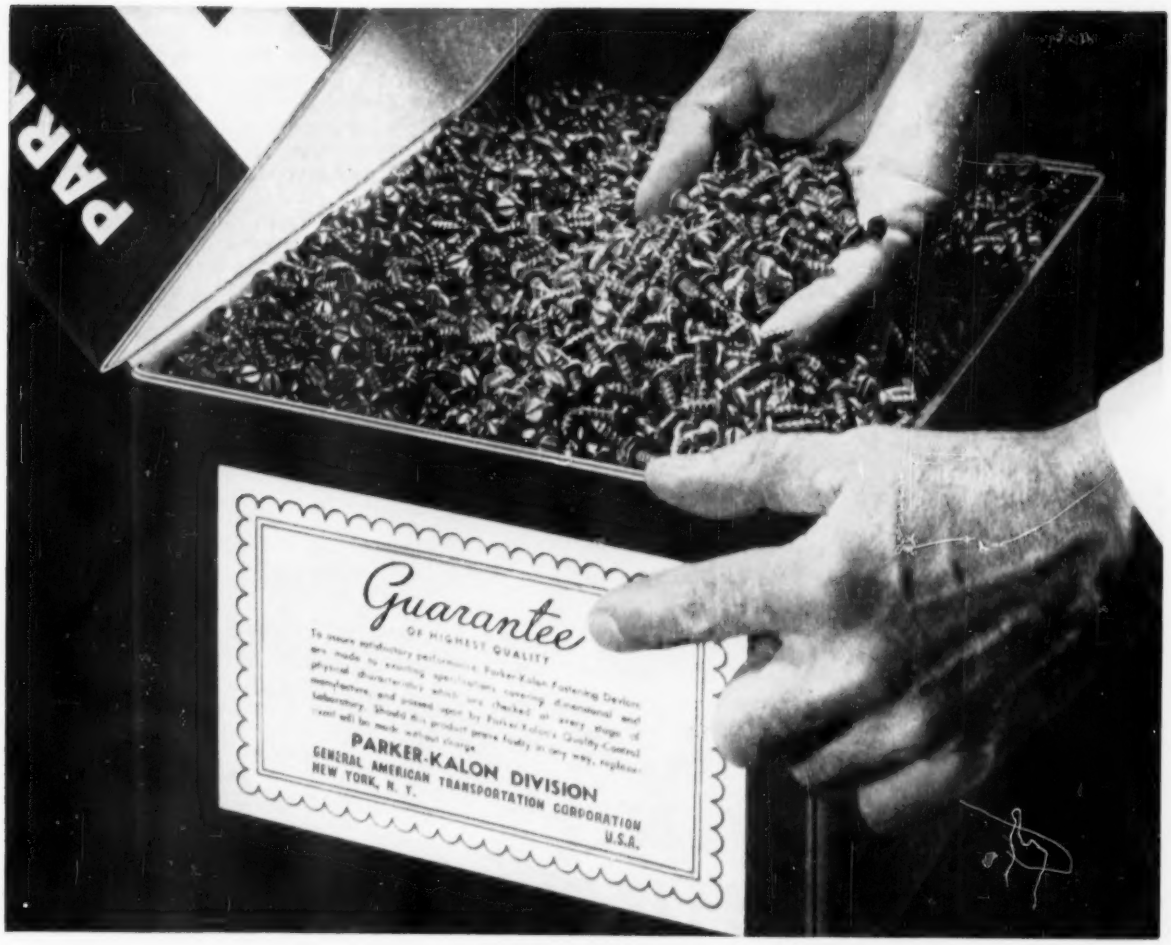
Needless to say, my superior hit the roof. I never did succeed in setting that man up. He couldn't even begin to realize that he was being offered an opportunity, and not being begged to save the firm from ruin.

But I learned then, as Ed will have to learn, you can't promise what you don't have to give.

James K Matter
Detroit, Mich

AN EMPLOYEE was going to leave his place of employment, but changed his mind after talking to Personnel. The employee was honest in his in-

"OK, OK, take it easy! . . . They were delivered here by mistake!"



P-K® self-tapping screws **GUARANTEED**

to keep your assembly line humming

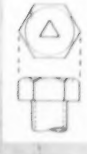
You get a written guarantee of highest quality on every package

Pick up a package of P-K screws and open it. You'll see immediately that these are fasteners of outstanding quality. Read the guarantee —see the protection you get with P-K. The most important thing is the performance of P-K Self-tapping Screws. They're pointed, threaded, headed and hardened to start right, drive right and stay tight. That adds up to assembly savings for you—a smooth flow of production without wasted time and money caused by screw failures. That's why it pays to insist on the best—the screws that guarantee "if it's P-K, it's O.K."

LOOK FOR THE TRIANGLE MARKS THAT TELL YOU IT'S A GENUINE P-K △

Non-Countersunk Heads—12 impressed triangles under head

Countersunk Heads—6 impressed triangles under head



Hexagon Heads—1 embossed triangle on top of head

PARKER-KALON DIVISION, *General American Transportation Corporation*

Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws

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AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & DeLeeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

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MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

tention to leave and did the right thing by turning in his resignation. Perhaps Personnel persuaded the employee to stay. I can see no reason to punish this man. To be honest is of the utmost importance in relations between staff and line.

Apparently Ed jumped the gun when he promised to promote other workers before the termination of Johnson was complete. Johnson was a good employee. All good employees are worth saving. Ed was mad because he was overruled.

We find ourselves overruled many times in life, but usually we have made a mistake in the first place. We shouldn't feel badly about this when we find top brass has been overruled many times in the past. When the foreman or supervisor become angry, they lose control. When they lose control, they lose reason. When they lose reason, the company suffers.

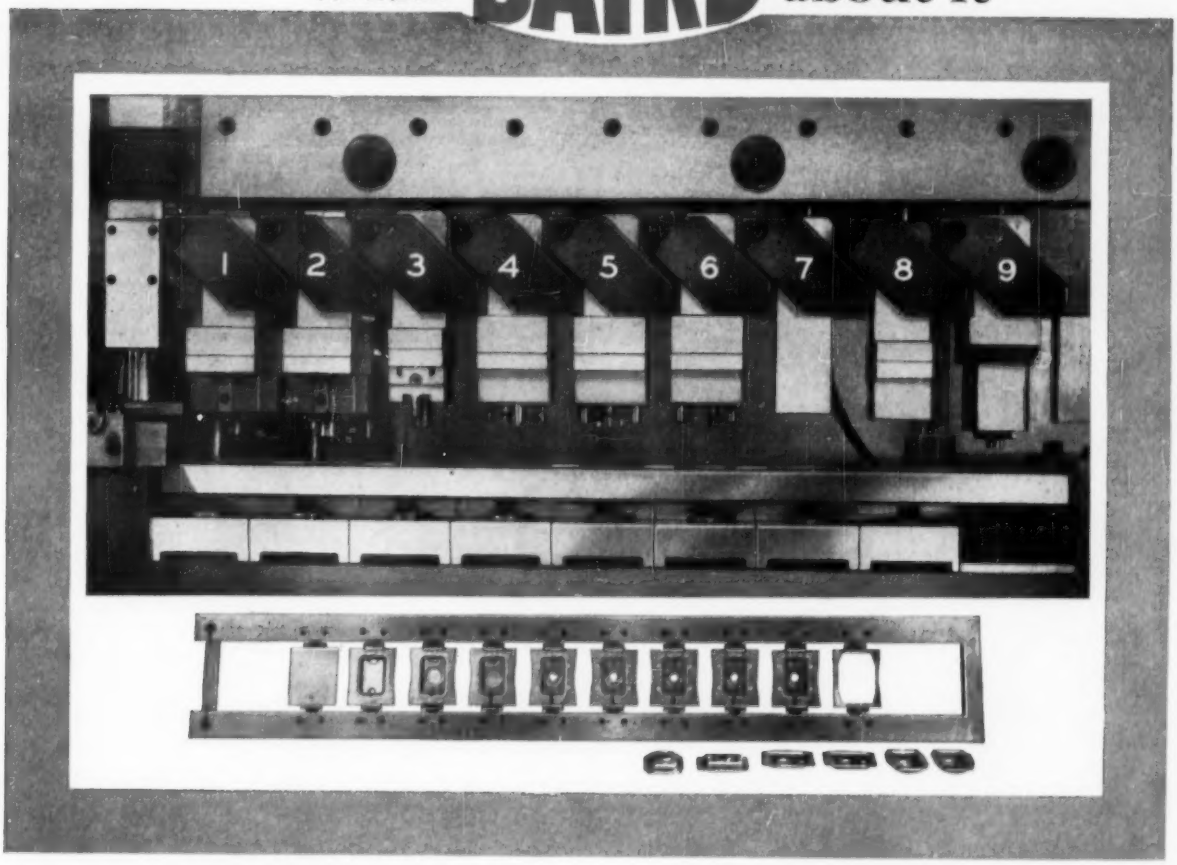
A E Salmons
Norristown, Penna

Running an industrial organization is an everlasting struggle. Production doesn't just roll along at the speed at which you drive the conveyors; it requires constant attention. There are always material shortages, tool and machine breakdowns, and the never-ending modifications and design changes. Even the best organizations, with expert planning, face interruptions and delays. Problems with labor and personnel are not the least of the troubles faced by management.

The company that rehires a man

"Speaking of porta'le dust collectors, there's a stationary one."

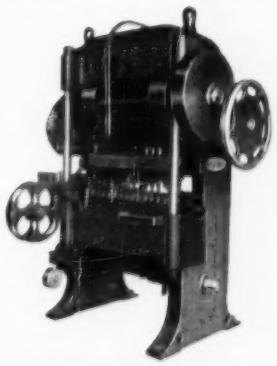
...ask BAIRD about it



How to make money on a "FOUR-FOOT PRODUCTION LINE"

This typical tooling on a Baird Automatic Multiple Transfer Press is, in effect, a complete production line for oven switch plates and a very profitable one at that. Because not only does this machine produce at the rate of 3,600 pieces per hour day in and day out but, like all Baird Multiple Transfer Presses, tool maintenance is extremely low; tool changes when required are very quickly made with minimum down-time.

You, too, can enjoy this kind of HIGH SPEED, HIGH ACCURACY, LOW COST and SMOOTH RUNNING production by combining operations on Baird Automatic Multiple Transfer Presses. Because of Baird's exclusive design, with such important features as gate dwell and new type of transfer mechanism, MORE operations of MORE different types are now possible in a single tooling. It always pays to "ask Baird about it" before you tool. Write Dept AM.



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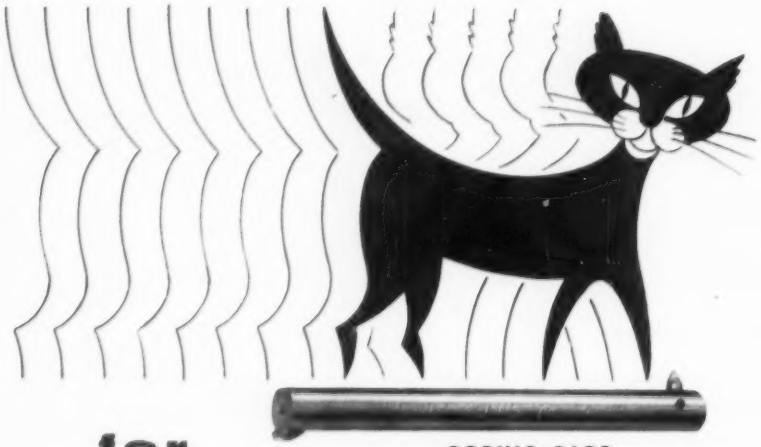

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"No-Chat" is available in round, square or rectangular stock or as finished tools with brazed or mechanically held tips.

For more information ask your local Wendt-Sonis distributor or fill in the attached coupon.

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*"No-Chat" is a registered trade name of the P. R. Mallory Co.

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Please send me literature on Wendt-Sonis "No-Chat."

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who submitted his resignation and then changed his mind is just giving itself one more possible source of difficulty. Unless there is a labor shortage in the area, or there is a very special reason for doing so, the man who resigned should not be rehired. There are probably dozens of places where this man can go for a job. And there are many ways for the employer to tap the labor market for a replacement. Of all the possibilities open to each of them, why should they attempt to make a success of the one combination which possesses an inherent fault capable of causing difficulties?

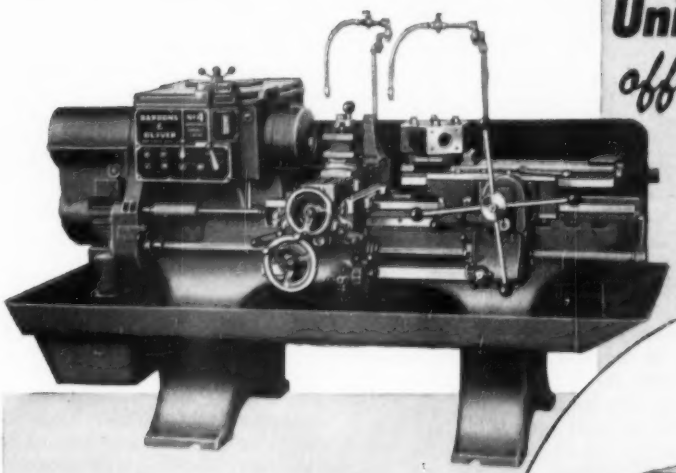
This man is evidently dissatisfied to some extent with his position in the organization. He no doubt had a promise of another job when he resigned. Perhaps the promise was cancelled, or he found out that the new job was not all that he expected. In any case, it is very likely that he will continue to look for a new position, and resign once again when he finds one.

This aspect of the problem only involves the employer and the employee. There is a more serious side, namely the effect upon the other employees. If the man is rehired and later on resigns, it will look bad for the company. It will appear that they needed him to such an extent that they were willing to take him back and gamble on his staying with them. The other employees will begin to feel indispensable and irreplaceable. In addition, if the company seems so anxious to keep a man on in its employ, the employees may begin to question the reason for this. They may decide that the company wants to keep him on because it could not possibly find another to do the work at that rate of pay.

The company must of necessity

"I tried to grab Mulrooney to help with that overtime, Boss!"

The BARDONS & OLIVER No. 4 Universal Turret Lathe offers these outstanding HEADSTOCK Features



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- All headstock gears of alloy steel, flame hardened and precision finished
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- Cool, filtered lubricating oil pumped to all headstock bearings, gears and clutches from separate reservoir in the head-end leg

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ACE DRILL

ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

maintain command of the situation; it cannot afford to have its position weakened just for the sake of one employee. The best procedure is to accept the resignation in a friendly manner, wish the man good luck, and send him on his way.

Sing Yen
Brooklyn, NY

I DON'T think Johnson should be criticized, certainly not punished, for changing his mind about changing his job, if this is a first offense. It is not, of course, an offense at all but it would be if it became a matter of habit.

About twenty-odd years ago I was employed as engineer in a world famous shipbuilding yard on the River Clyde. We specialized in first-class passenger and mail-ship jobs such as P & O, Cunard etc. It may be of interest to American readers to know that in such yards, over here in Scotland, the head foreman joiner is a power to be reckoned with, and much of the design of ships' furniture emanates from him.

The particular head foreman joiner in the yard concerned was really high quality stuff, but was forever giving in his notice over trivial disagreement with the higher-ups. This was well known in the yard, and one joker was heard to remark that Angus went about with his notice in his pocket, all written out for immediate presentation if required.

In those days, there was much idleset and, in spite of that dismal fact, the yard management felt it to be good business to retain the services of the touchy Angus and ignore his repeated offers of resignation. An excellent tribute to his value to the company. Those observations differ slightly from the example but I think, indirectly, they apply in the sense that much can be forgiven in a really good servant.

That is a line of thought that Ed should ponder, especially at this time when really good men can pick and choose where they will work and for whom they will work. As I see it, Ed is taking an unreasonable and a short-sighted view of Johnson's change of front. He is also in flight from facts, one of which is that really high grade craftsmen are virtually irreplaceable the world over today.

Personnel, relatively a youthful industrial grade, will be more in tune with the laissez-faire prevailing in the shops today than will Ed and, as a consequence, would take Johnson's change of mind as a matter of course and act accordingly without loss of sleep. They will know nothing of the good old days when the shop foreman, bowler far back on his head, strutted pugnaciously about the shops, squirting tobacco juice around. Picture *him* being offered a packet of chewing gum, or a cup of tea!

In those harsh, stern days, the ground fronting the main gate of most shipbuilding yards was known as "the market." Hither came the idle squads in search of employment. There was no dole, no labor exchange, no welfare state. Work started at 6 AM and the idle men presented themselves at the market before that time. About 6:15, the foreman riveter might appear and without greeting of any sort would point and shout "You Murphy, you Dolan, you Reilly" and so on till the squads for the day were made up. That conduct, today, would put every yard in Britain on strike but, in those lean times, men counted themselves lucky to catch the foreman's eye.

Nonetheless, I cannot help feeling Ed is taking too much for granted in making a song about Johnson's somersault. He does not seem to have sounded Johnson out about his change of mind. Were the truth known, Johnson may be as much annoyed as Ed himself since it may not be a voluntary change on Johnson's part.

As a youngish man, I once found myself in exactly the same position, through no fault of my own. At the time I was assistant works manager with a large company. I had a wife and two young children and was keen to improve my status and salary. An application to a medium-

"Says he finds the work a lot more of a challenge since he started using only one fork."

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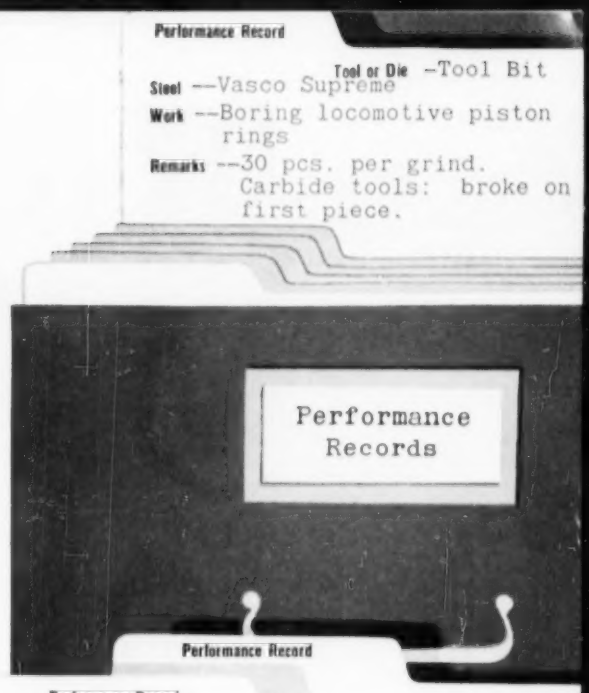
Performance Record
Tool or Die --Tool Bit
Steel --Vasco Supreme
Work --Boring locomotive piston rings
Remarks --30 pcs. per grind. Carbide tools: broke on first piece.
Performance Records
Performance Record

Performance Record

Tool or Die --Rough Facing Tool

Steel --Vasco Supreme
Work --Rough & finish facing cast connecting rods.
Remarks --28 pcs. per grind, 150 pcs. per tool.Carbide, 8 pcs. before breaking.

Performance Record

Performance Record

Performance Record

Steel --Neatro **Tool or Die** --Core Die
Work --Molding iron powders
Remarks --Replaced carbide on basis of cost and performance.

Performance Record

Steel --Vasco Supreme **Tool or Die** --Lamination Die
Work --Blanking .025" sheet
Remarks --230,000 pcs. per grind: 10,000,000 pcs. per die. Carbide: die broke at 33000 pcs.; another at 550,000 pcs.

Performance Record

Steel --Vasco Supreme **Tool or Die** --Scalping Die
Work --Removing surface of brass, bronze and copper tubing
Remarks --199,000 ft of tubing and still in good condition. Carbide: broke at 141,000 ft.

Performance Record

Steel --Vasco Supreme **Tool or Die** --Tool Bit
Work --Turning cold rolled C-115
Remarks --Produced twice as many pieces per tool as carbide tools, at rate of 3600 pcs. per day.

Performance Record

Steel --Red Cut Superior **Tool or Die** --Form Cutter
Work --Form cutting bearing races
Remarks --1st day of test: Vasco Supreme 157 pcs.; Red Cut Superior 100 pcs.; carbide 35 pcs. 2nd day: Vasco Supreme 193 pcs.; Red Cut Superior 126 pcs.; carbide 35 pcs.

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size concern resulted in my acceptance of the works managership. After my notice had run three weeks, a domestic upset occurred which made imperative my continued residence where I was then employed.

I took an early opportunity to explain my dilemma to my chief who seemed pleased rather than otherwise. I then wrote an explanatory apology to the other company. Johnson may have had a compelling reason for changing his mind and the change may not have been to his liking, any more than Ed's.

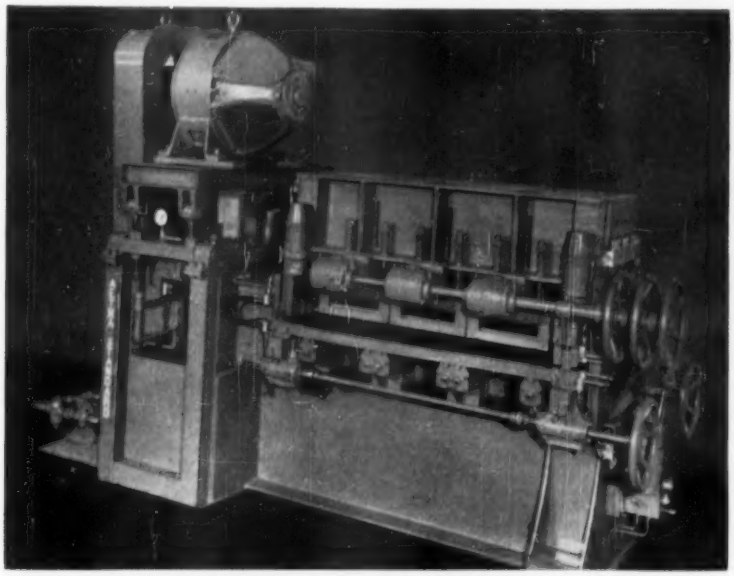
If no alternative promotions are in the offing, there is nothing Ed can do for the men who were promised a move up but make a clean breast of the turnabout. In doing so, he will lay bare the fact that, in an administrative sense, he has handled the business like the merest amateur. An experienced executive would have pictured in his own mind who would benefit by Johnson's going, but would have kept it a mental picture till he was gone. No experienced foreman fills a job till it becomes vacant and Ed should have been aware of that fact.

"There's many a slip," and experienced executives guard against such a contingency; it saves a lot of trouble, later. In engaging, promoting, sacking, timing is important. Ed's attitude toward Johnson is deplorable and childish. His handling of the second stage is impulsive and ill-considered. He alone is to blame for his heavy handling of a minor happening, which is the root-cause of all the trouble.

C Donald
Lanarkshire, Scotland

"Mind you, fellows, it's only a suggestion—you don't have to follow it unless you want to keep your jobs!"

BEARING TIPS by McGill



138 GUIDEROL® BEARINGS BACK UP WORK ROLLS IN AETNA STANDARD LEVELER

High load capacity vital to back-up roll support

For processing 16 to 30 gauge steel sheets and coils, this Roller Leveler built by Aetna Standard Engineering Company requires dependable components to deliver a consistent maximum output at speeds up to 400 feet a minute.

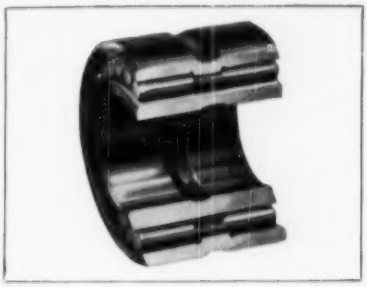
McGill GUIDEROL GR-16 bearings were selected for this machine and several larger versions use GR-24 and GR-36 bearings. They can carry the heavy irregular loads associated with flattening and leveling steel sheets and strips. Requiring less radial space, Guiderol bearings provide maximum roll neck diameters and offer greater strength at the necks of larger back-up rollers.

On the machine shown above, there is a total of 36 back-up rollers in 3 upper banks and 33 in 3 lower banks to resist the heavy pressure of the 48 inch working rolls. With a GUIDEROL bearing at each end of the 1¾" back-up rolls, a total of 138 bearings is required for the Leveler. These bearings have proved especially suited to supporting heavy loads longer in small radial space with reduced maintenance and production down time — important in steel mill operations.

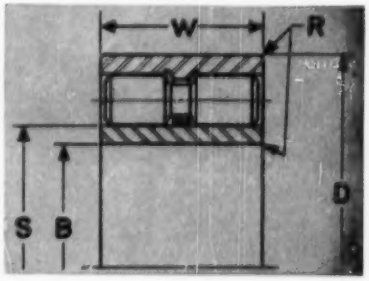
American Hoist Uses CT Series In Crane Blocks

Crane Blocks built by American Hoist and Derrick to withstand the greater strains and rough usage of lifts up to 500 tons rely on the greater capacity of GUIDEROL CT Series bearings in the sheaves. Interchangeable with retainer type cylindrical roller bearings, the CT Series full type roller construction has added capacity of over 38%. In sheaves these bearings offer greater angular stability with full race width rollers. Center guiding without retainer keeps these rollers aligned and prevents binding under eccentric loads.

Center-Guided Rollers Eliminate Load Wasting Cages



Guiderol Bearings inherently possess exceptionally high radial load capacity due to their full complement of small diameter rollers. Grooved rollers and a center guide rail keep rollers aligned as insurance against skewing and binding that is possible with ordinary needle bearings. Sizes interchange with needle and cylindrical roller bearings.



CT Series Adds Guided Roller Advantages to Cylindrical Roller and Ball Bearing Sizes

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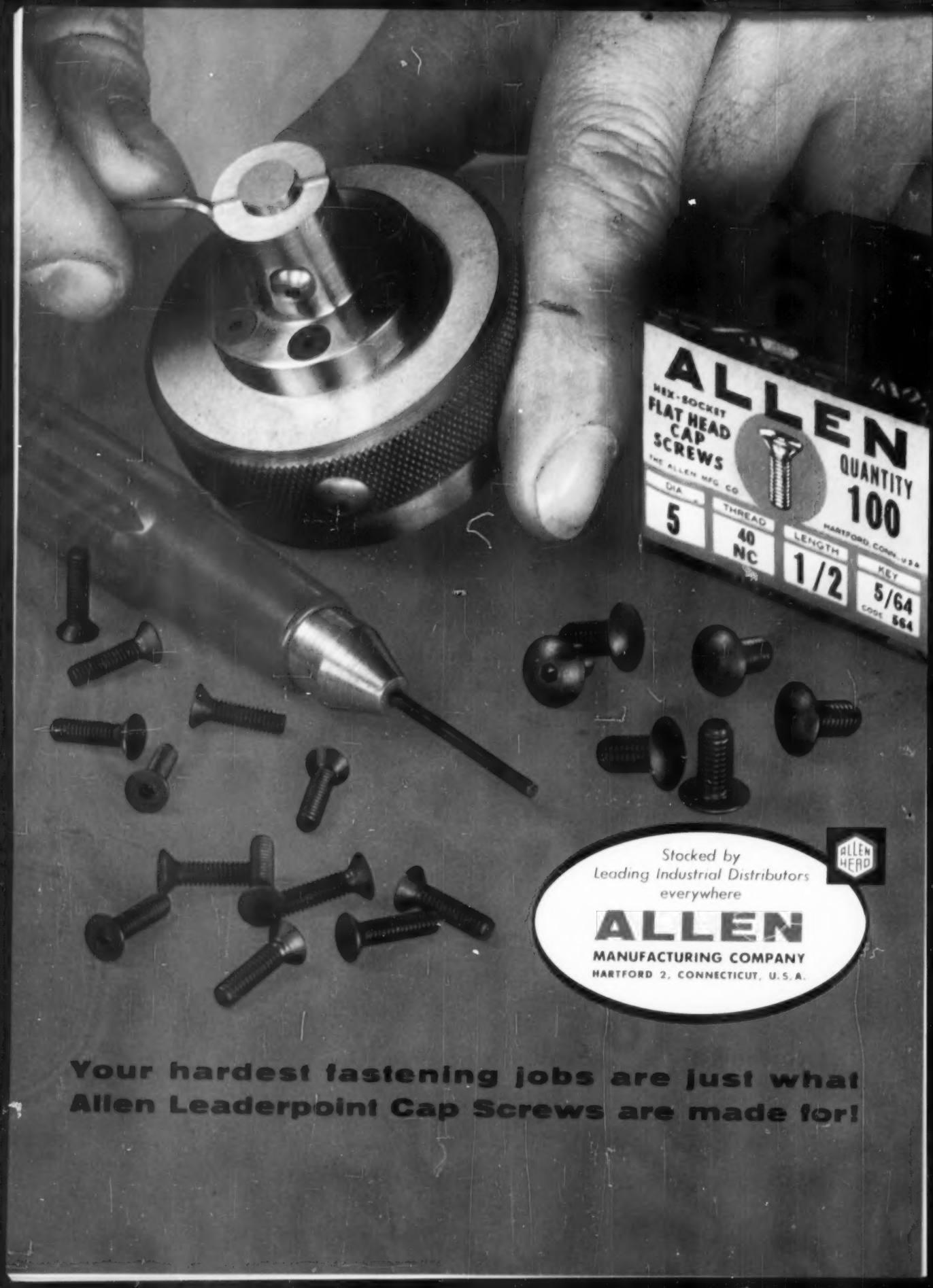
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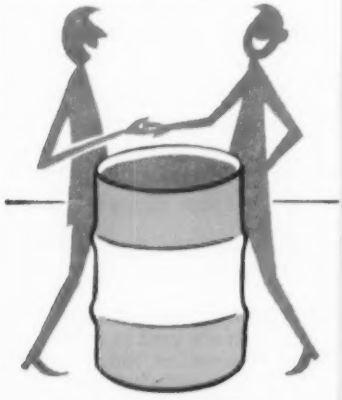

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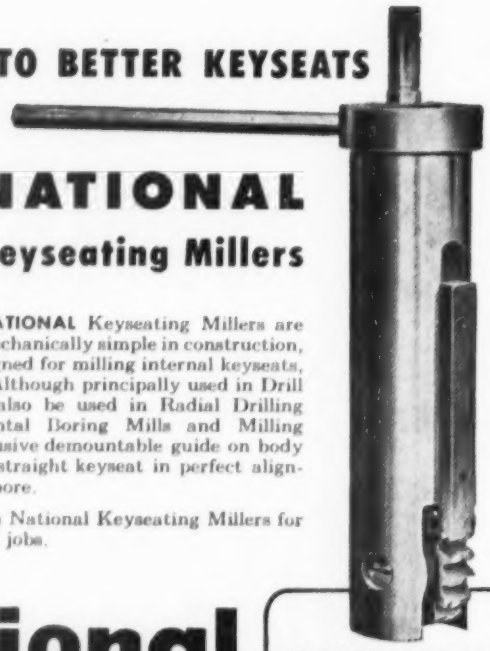

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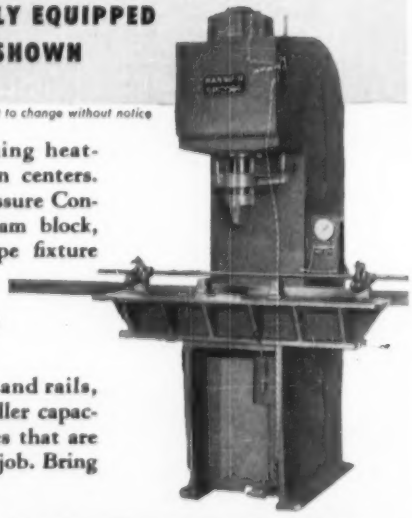
complete, handy size

This 25-TON Hannifin
Straightening Press Sells For
$4,133 FULLY EQUIPPED AS SHOWN

Price F.O.B. our press plant at St. Marys, Ohio, subject to change without notice



The ideal press for straightening heat-treated parts up to 60" between centers. Exclusive Hannifin Sensitive Pressure Control for speed and accuracy. Ram block, two table blocks and center-type fixture complete with rails included.

STRAIGHTENING PRESSES
FROM 5 TO 150 TONS

Hannifin offers longer tables and rails, roller-type fixtures, larger or smaller capacities (5 to 150 tons)—all at prices that are easily justified by savings on the job. Bring us your straightening problems.

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ries him through the basic theory underlying the process, explains the various methods that may be employed, and explains in some detail the different machines and equipment used.

A separate chapter is devoted to welding symbols and their meaning, others deal with weldability, weld quality, procedure specifications and qualification, and inspection and testing.

The material has been prepared by outstanding authorities in the various fields, but every care has been taken to avoid abstruse language and to make the text readily understandable by readers without previous knowledge.

•

TECHNIQUES OF PLANT MAINTENANCE 1956—*Published by Clapp & Poliak Inc, 341 Madison Ave, New York 17, N Y. 248 pages. Price $10.*

A comprehensive report on modern plant practices in plant maintenance, this book reports the proceedings of the conference held in connection with the Plant Maintenance and Engineering Show. It contains the complete text of 16 papers, summaries of 15 roundtable discussions, and the answers to some 1100 specific questions.

Five industries get special attention, including air transport shops, chemical plants, petroleum refineries, paper mills and paper products plants, and textile mills.

Among the many subjects covered are: preventive maintenance, equipment replacement policies, design and operation of maintenance shops, cost control, use of punched cards, machine tools, and toolroom control.

•

BASIC EFFECTS OF ENVIRONMENT ON STRENGTH AND EMBRITTLEMENT OF METALS—*ASTM Special Technical Publication No. 171. Published by the American Society for Testing Materials, 1916 Race St, Philadelphia 3. 120 pages, 6 by 9 in. Price, $2.75.*

Most creep and creep-rupture tests on high-temperature alloys are carried out in normal atmospheres However, most high-temperature materials are used in atmospheres of water vapor or some products of combustion. Therefore, the design engineer must always be concerned with the effects of the environment

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upon the creep rate and the ductility of materials. The papers which make up this symposium represent, it is believed, accurately the status of the problem of environment at the present time.

•

CASTING KAISER ALUMINUM—*Published by Technical Publications Dept A-8, Kaiser Aluminum & Chemical Sales, Inc, 919 N Michigan Ave, Chicago 11, Ill. 388 pages. Free when requested on company letterhead; otherwise $5.*

Fourth in the new series of Kaiser aluminum books, this volume includes information on the characteristics of aluminum casting alloys and the melting practices, each of the major casting processes, heat treatment, inspection, and other supplementary operations.

Casting methods covered are sand, permanent-mold, die, shell-mold, plaster-mold, investment, and centrifugal casting. The book is up to the high standard set by the earlier volumes, both in the thoroughness of the coverage and the quality of the presentation.

•

GESAMTKATALOG DER DEUTSCHEN WERKZEUGINDUSTRIE (GENERAL CATALOG OF THE GERMAN TOOL INDUSTRY) *Vol 2—Published by Verlag W Giradet, Essen, Germany. 385 pages 8½ x 11½. Price DM 88.*

Printed in five languages, German, English, French, Spanish, and Portuguese, this volume forms a complete catalog of twist drills, reamers, taps, dies, milling cutters, broaches, chucking tools, jigs and fixtures, and measuring tools and instruments.

Each different type of tool is illustrated, and standard dimensions are listed, but it is difficult to see what purpose is served by the catalog, as it does not give names and addresses of manufacturers, or any indication as to price. It may be of interest to know that all the tools listed are available in Germany but, as they correspond almost exactly with those produced in the US, such knowledge would not appear to serve any useful purpose. The principal advantage to an American reader is the book's use as a technical dictionary.

GREATER DIE LIFE AND LOWER FABRICATION COSTS are achieved with "Thiokol"-epoxy plastic die caps. This plastic-capped die is one of the largest ever made at Republic Aviation Corporation.

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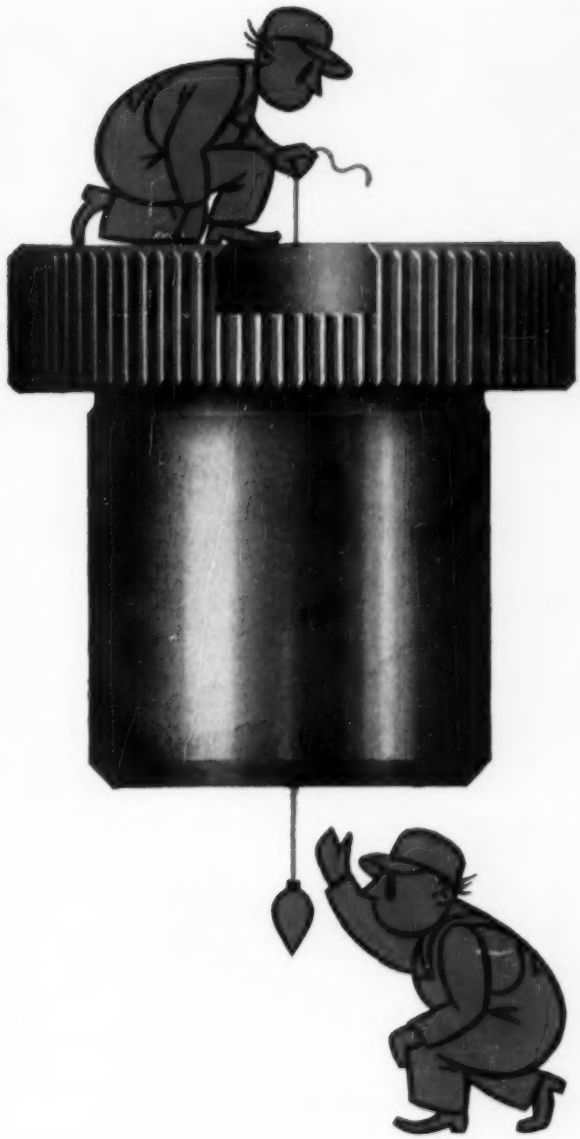

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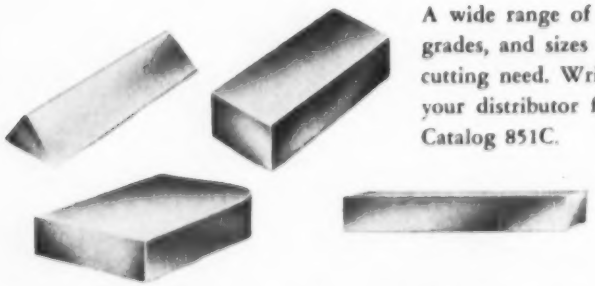

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Names in the News . . .

Herman H Flaum, assistant to the production engineer of Cleveland Cap Screw Co, has been made superintendent of cold and hot header operations at the company's two Cleveland plants. **Andrew V Wetzel,** metallurgist, has been promoted to chief metallurgist.

A J Hendry, sales manager of the welding department of Westinghouse Electric Corp's Motor & Control Division, has been appointed sales manager of the Standard Control Division.

Emmett D Quan has been appointed assistant to the vice president, manufacturing, of Pullman-Standard Car Mfg Co, Chicago. He has been serving as works manager of the car works.

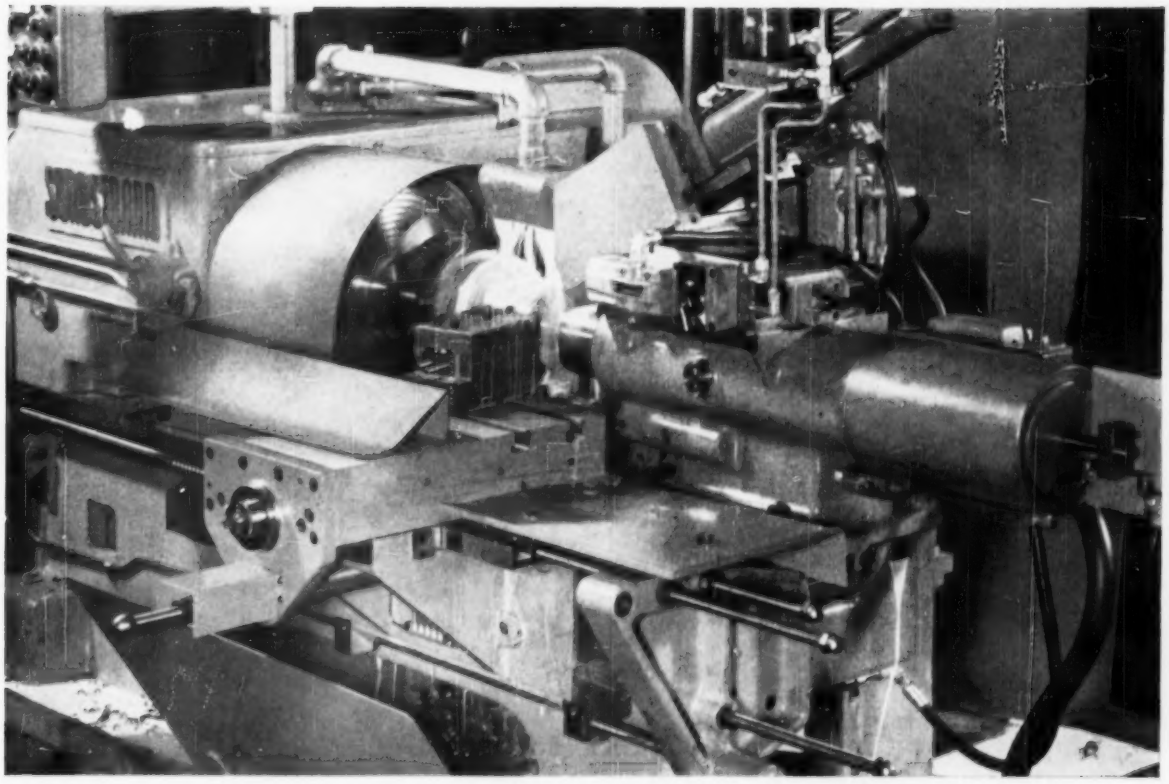
King D Christopher has been named general manager of the newly established Los Angeles Division of Clark Controller Co, Cleveland. He has been district sales manager in the territory since 1951.

Seth H Stoner, general works manager of General Motors Corp's New Departure Division, has been named chief engineer. **Frederick J Garbarino,** who formerly held the post, has been appointed divisional director of quality control.

Robert B Heppenstall, Jr, general manager of the Bridgeport, Conn, plant of Heppenstall Co, has been appointed general manager of the company's Ring Division, with headquarters at the Indianapolis, Ind, plant. **Charles B Cobun,** associated with the company's Chicago district sales office, has been named manager of ring sales, succeeding **Charles A Shenberger,** who has resigned.

W J Sparling, vice president in charge of Milwaukee operations for Chain Belt Co, has been named vice president, manufacturing and industrial equipment, in charge of the divisions making up the newly established Industrial Equipment Section. **O W Carpenter,** vice president, finance, will serve as vice president in charge of the new Construction Machinery Section.

George C Wilsher, who has been heading the engineering department of Holcroft & Co, Detroit manufacturer of heat treating furnaces, has



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New PUROSOL HD Soluble Oil has tool-saving E.P. properties of more costly sulfurized mineral oil fluids

Now you can get *both* finer finishes and longer tool life on a wide variety of heavy-duty machining operations with a new water soluble cutting fluid. It's PUROSOL HD Soluble Oil—the exclusive Pure Oil product that keeps tool bits 50% cooler than ordinary soluble oils on operations where tool point pressures reach up to 400,000 psi.

PUROSOL HD is especially suited for roughing operations on high Brinell steels that fall into the Class 3 (40-50%) and Class 4 (40% or lower) machinability ratings. Use it on your heavy thread cutting, metal sawing, or on external broaching operatings for outstanding results.

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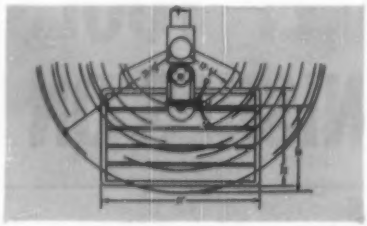
Big, cumbersome jobs are duck soup to this adaptable Radial Drill Press!

This is your drill press for big, bulky jobs, where it's faster and easier to move the drill head than the work. This Walker-Turner Radial Drill gives you really *big* under-the-drill capacity — you can drill to the center of a 62" circle, or locate the drill anywhere on sheet stock up to five feet wide. Perfect for sheet stock of all kinds, plywood, switchboard panels.



1600 Series — "Light-Heavyweight" Radial Drill Press — Ram travel, 18"; spindle travel, 4" (special models available with 6" spindle travel). Six-spline, full floating spindle. Spindle speeds from 110 to 8300 rpm. Capacity to ½" in cast iron. Drill head and motor assembly tilt to 45°, right or left.

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JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

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INCORPORATED
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been named vice president, engineering.

S J Laudenslayer, assistant superintendent of the No. 6 machine shop at the Bethlehem, Penna, plant of Bethlehem Steel Co, has been named superintendent, succeeding **W H Wright,** retired.

R H Rice, vice president of North American Aviation, has been named general manager of the company's Los Angeles Division. **R H Ruud,** manufacturing manager, has been appointed assistant general manager.

Fred J Fleischauer has joined the Teller Co, Butler, Penna, as chief design engineer of the Special Machinery Division.

Charles C Schott has been appointed manager of the Baltimore plant of American Radiator & Standard Sanitary Corp. Formerly general superintendent, he succeeds **James Toy,** who has retired.

C K Olson, Jr, has been elected vice president and sales director of Yates-American Machine Co, Beloit, Wis.

Ray E Frase has been named manager of Signode Steel Strapping Co's (Chicago) recently created special products department.

U R Jaeger has been named sales manager for Roll-Bond products in the Western Brass Division of Olin Mathieson Chemical Corp. He joined the company last year as eastern district manager.

L Deane Hall has been appointed general manager of the Ralph C Coxhead Corp, Newark, NJ, firm recently acquired by Addressograph-Multigraph Corp of Cleveland, Ohio. Mr Hall has served as Multigraph branch manager in Peoria, Indianapolis, and Boston.

Waldemar Naujoks, associated with the forging industry for more than 30 years, has joined Kropp Forge Co, Chicago, as manager of engineering.

Chester A Chamberlain has been appointed assistant to the president of Diebold, Inc, Canton, Ohio. He was formerly assistant to the president of E W Bliss Co

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Here's a fast, economical method of high-strength assembly utilizing Selas gas-fired automatic heat processing. Combining low first cost, minimum labor skills, high production capacity, consistent product quality . . . each Selas automatic brazing machine is custom-built to the customer's individual requirements. Yet, it is highly versatile, easily adjusted for different heat placement or time cycles.
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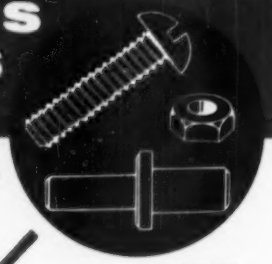

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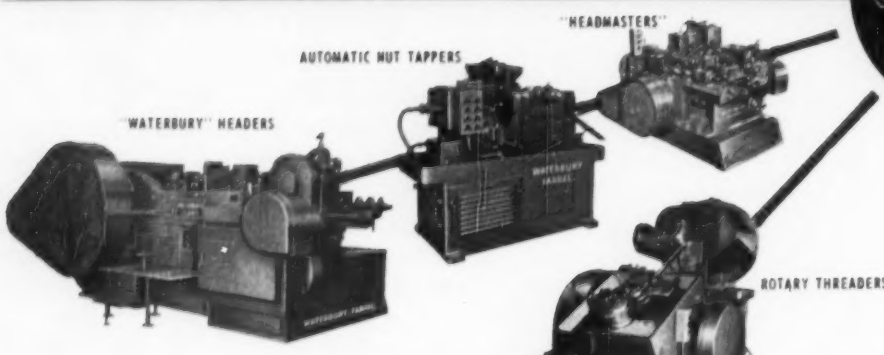

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"MODEL 5" SLOTTERS

HIGH SPEED THREADERS

HIGH SPEED SLOTTERS

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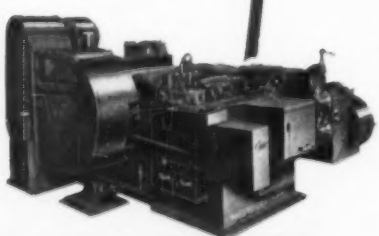

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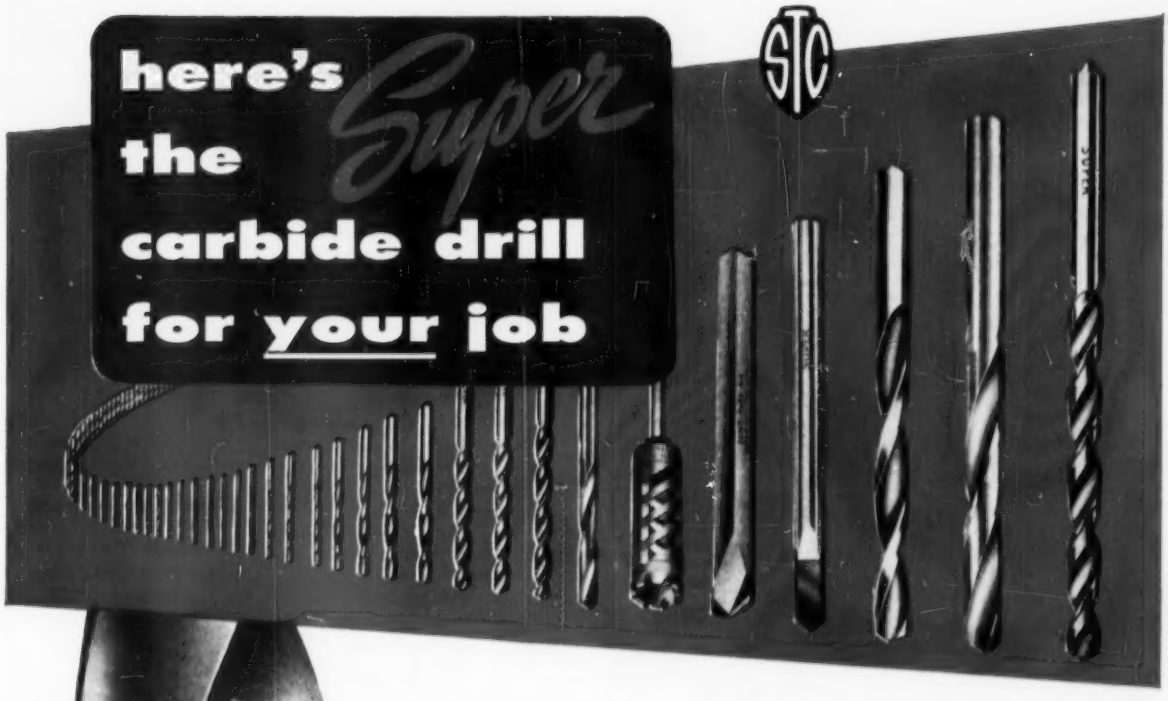

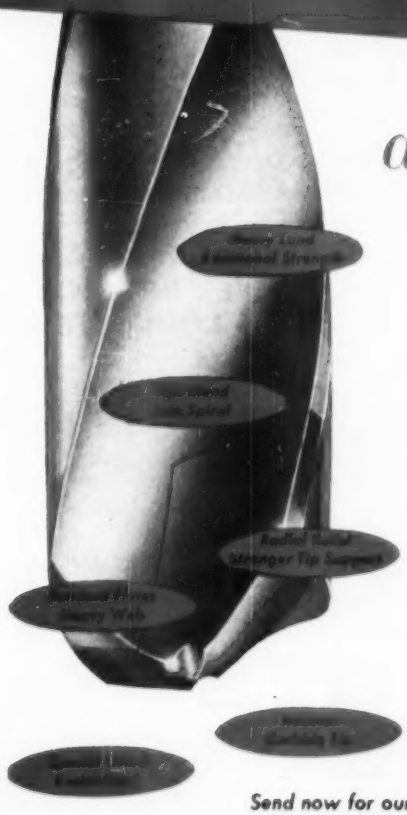

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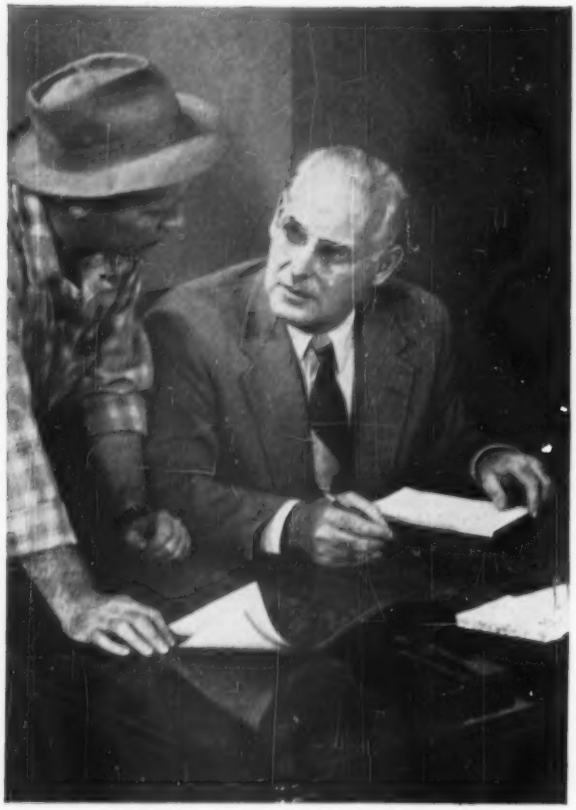

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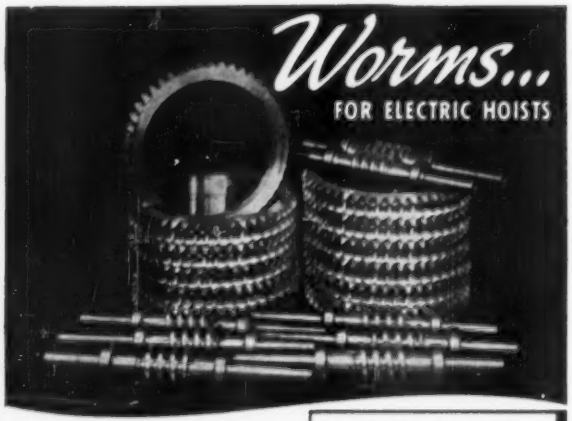

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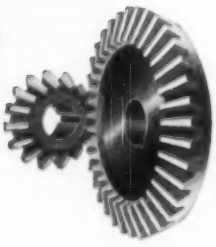

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Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

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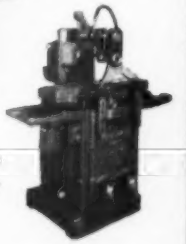

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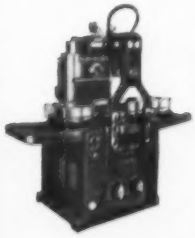

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THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Whatever kind of gears you make...
Whatever way you make them

National Tool Co.

can supply the right type cutting tool
because we make *all* types

Gear Shaving Cutters

Hobs

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.

Rack Type Gear Shaper Cutters

Gear Shaper Cutters

Involute Gear Cutters

Master Gears

Herringbone Gear Cutters

1905 • 1955
Over 50 Years

National
TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers

Emanuel Hochman, Vice-President and General Sales Manager, Bulova Watch Co., tells how:

"We put radios into the diamond business!"

"We've put Bulova Radios into 17,612 jewelry stores — and captured a large share of the radio business!

"But we couldn't have done it without Air Express!

"Parts come from 180 different suppliers via Air Express for assembly. Production schedules are always tight — Air Express gives us valuable leeway which we regularly need.

"In fact, we often make use of Air Express to deliver finished radios to our retail outlets. And we never miss a date.

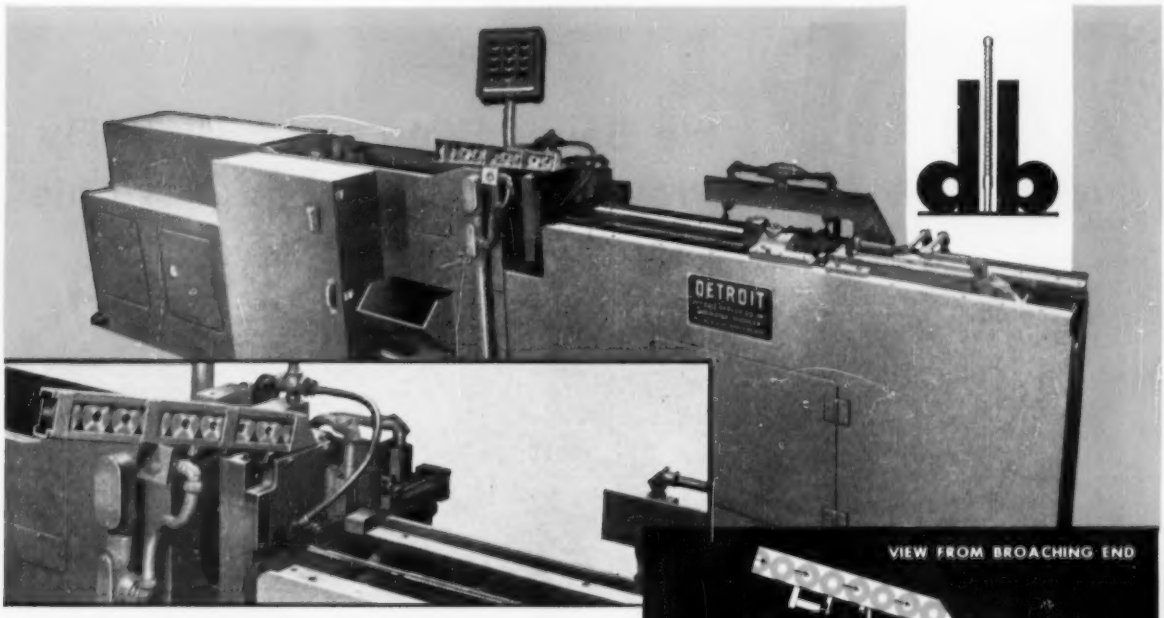
"Air Express took our new business 'off the ground' — keeps us the fastest-growing radio company in America!

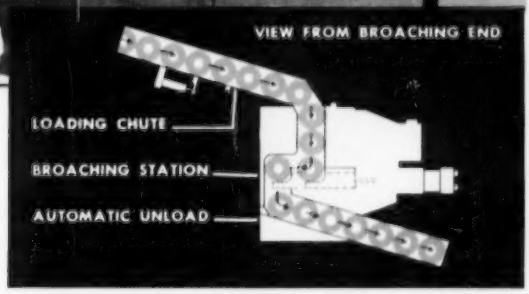
"Yet, most of our Air Express shipments cost less than with any other complete air service. 10 lbs., for instance, New York to Jacksonville, Florida, is $4.42. It's the lowest-priced complete service by $1.32!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY





Detroit Broach Horizontal Machine Broaches I.D. and Nineteen Splines

- ***Sizes I.D. and holds it concentric with Spline P.D.***
- ***Completely automatic 8-second cycle***

This 3-ton, 36-inch stroke Detroit Horizontal Broaching Machine is inexpensive, fast, and offers automatic operation, tool handling and work ejection. While manual chute loading is illustrated, optional automatic loading is easily accomplished.

During its 8-second automatic cycle the machine accurately sizes the I.D. and broaches 19 precision internal splines, keeping them 100% concentric with the I.D. Thus, subsequent operations are performed more easily and economically because of simplified work location and improved accuracy.

This simplicity with high production is typical of Detroit Broach & Machine Company engineering. Detroit builds every size and type of broaching machine, and will automate and tool them to fit your needs. Discuss *your* production problem with a Detroit field engineer, or send us details . . . today.

THE CYCLE

1. Part drops through chute into "LOAD" position
2. Loader pushes part into broaching position
3. Loading signals automatic tool handling mechanism to move broach in to engage broach puller
4. Broach is pulled through work to end of pre-set stroke
5. Loader returns, broached part drops into unloading chute, next part drops into "LOAD" position
6. Returned loader signals machine to return broach to tool handling mechanism.
7. Machine slide stops, tool handling mechanism returns broach to "START" position
8. Cycle repeats . . . EVERY 8 SECONDS!

DETROIT BROACH
& MACHINE COMPANY
DEPARTMENT A-9
ROCHESTER, MICHIGAN

He Saves Eyes and Dollars By Preventing Accidents Like This

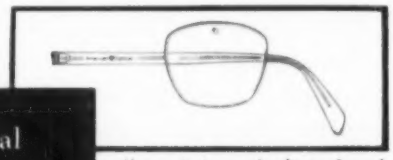
...He's A Safety Director!

Industrial eye accidents are costly — to *all* concerned. About 80,000 happen annually. In a recent case a carpenter lost the sight of his left eye when struck in the eye by an iron pipe on the job. He was awarded $3,562.50.

Accident prevention is a specialized business — and it belongs in the hands of a specialist — the Safety Director. He can prevent 98 per cent* of accidents like this when he has the full backing of management. He knows which rules work. He knows *quality* protective equipment and how it pays off.

In uninterrupted production, lower insurance costs and high plant morale he can *make money for you* as surely as a top administrator or salesman.

*According to the Society for the Prevention of Blindness 98% of eye accidents are preventable when workers wear safety glasses. Ask your AO† Safety Representative to call with case histories on the savings that have been made in your industry.



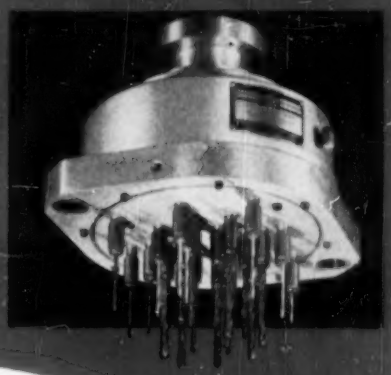
American Optical
SAFETY PRODUCTS DIVISION

Always insist on the AO trademark on safety lenses and frames.

†T.M. REG. BY AMERICAN OPTICAL COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

MAKE ZAGAR your HOLE CENTER FOR DRILLING, REAMING AND TAPPING . . . . . .



Any hole pattern — on any center up to 1⅛" dia.

Zagar's *Broad-Scope* *Engineering* SOLVES ANY HOLE PROBLEM

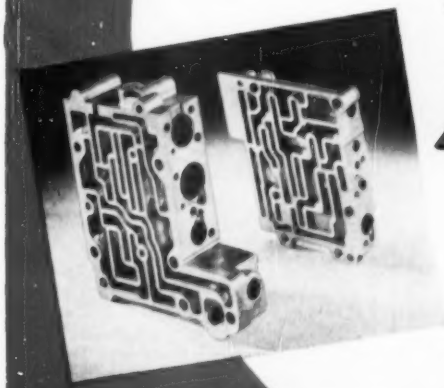
Zagar meets every drilling problem with the most effective, low cost equipment: gearless drill heads, standard drilling machines, special drilling machines, and index, trunnion or pallet-type multi-station transfer machines. We can furnish the complete tooling if you desire. Perhaps Zagar drill heads can be installed profitably on your own drill press. Send us a drawing of the part you are planning to drill. Or, let us study your present situation with a view to reducing your drilling cost.

ZAGAR, INC., 23886 Lakeland Blvd., Cleveland 23, Ohio

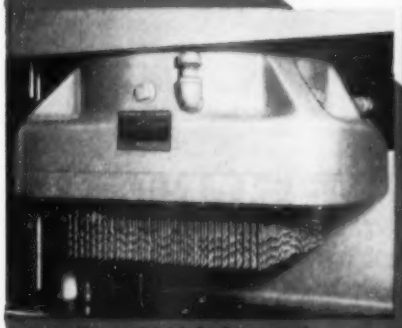
Zagar

TOOLS FOR INDUSTRY and SPECIAL MACHINERY

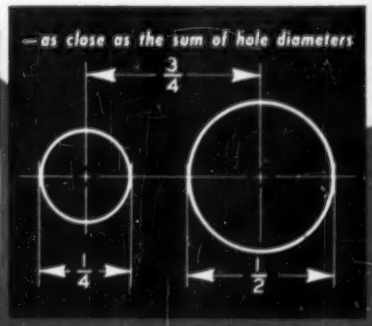
Write for our 9-page General Bulletin "A-9".

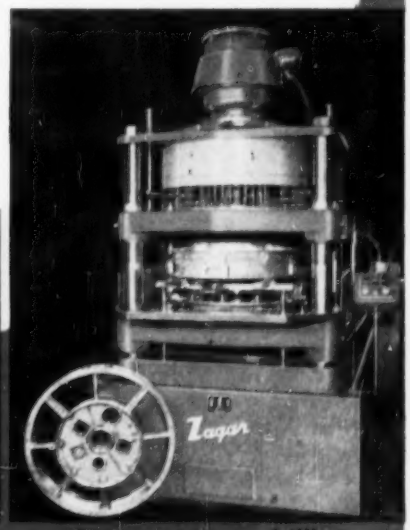


Any machinable material — from all angles.



Up to 1000 holes can be drilled IN ONE PASS.





4-post ram-type drilling machine for aircraft parts.

NEW
GREAVES
TOOLMAKERS OVERARM

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keywaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4" tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

Write for Complete Specifications and Prices

- Swivels permit any angular setting of spindle head.
- 2 HP independent motor drive.
- 8 speeds from 175 to 1750 RPM.
- Quill has 4" hand feed.
- Spindle equipped with No. 50 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in oil bath.
- Full vision oil level gauge.

RACK FEED. The overarm is equipped with rack feed for positioning over work.

GREAVES MACHINE TOOL DIVISION
J. A. FAY & EGAN COMPANY
2100 Eastern Avenue, Cincinnati 2, Ohio

Manufacturers of
GREAVES MILLS
"the MOST Mill for the LEAST Money!"

the ONLY
PORTABLE NIBBLER *that* CUTS
10 Gauge Steel

Model HN for 10 gauge Stainless Steel and 8 gauge Mild Steel. 6" radius.

Without Distortion!

A big statement . . . and only Fenway can make it! Our portable Nibblers have solved unusual problems for hundreds of users. Complete line includes the 14 gauge Nibbler and a light-duty 18 gauge Nibbler, and a special 90° head for each.

RCA—DU PONT—GENERAL MOTORS—and many others, use Fenway Portable Nibblers!

PAT. #2278174 #2783111 #2535631

Model MN for 14 gauge Stainless Steel and 13 gauge Mild Steel. 1" radius.

ALSO AVAILABLE: CORRUGATED, JIGSAW ASSEMBLY & AIR TOOLS

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FENWAY
MACHINE COMPANY INC.
Edgemont & Clementine Sts.
Philadelphia 34, Penna.

Distributed by EASCO PRODUCTS

From the *American Machinist* Library of *Tips for Top Shop Men*

SABOTAGE is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

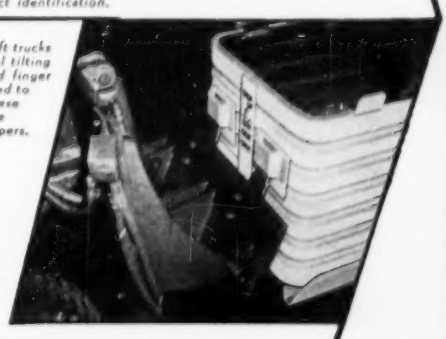
Modernized System was planned from box to hopper to conveyer to facilitate smooth flow.

Powell Dump-Hoppers Slash Handling Costs-

FOR LEADING FASTENER MANUFACTURER

At most stations the Powell Dump Hoppers are used as work boxes. The tapered nose makes access easy—special racks at various work stations tilt boxes forward, keeping work at operators' finger tips.

Working inventory is made easy. Dump Hoppers, when stacked, actually become stock bins, easy to work from and see into for product identification.



Standard lift trucks with special tilting devices and finger lifts are used to handle these versatile Dump Hoppers.

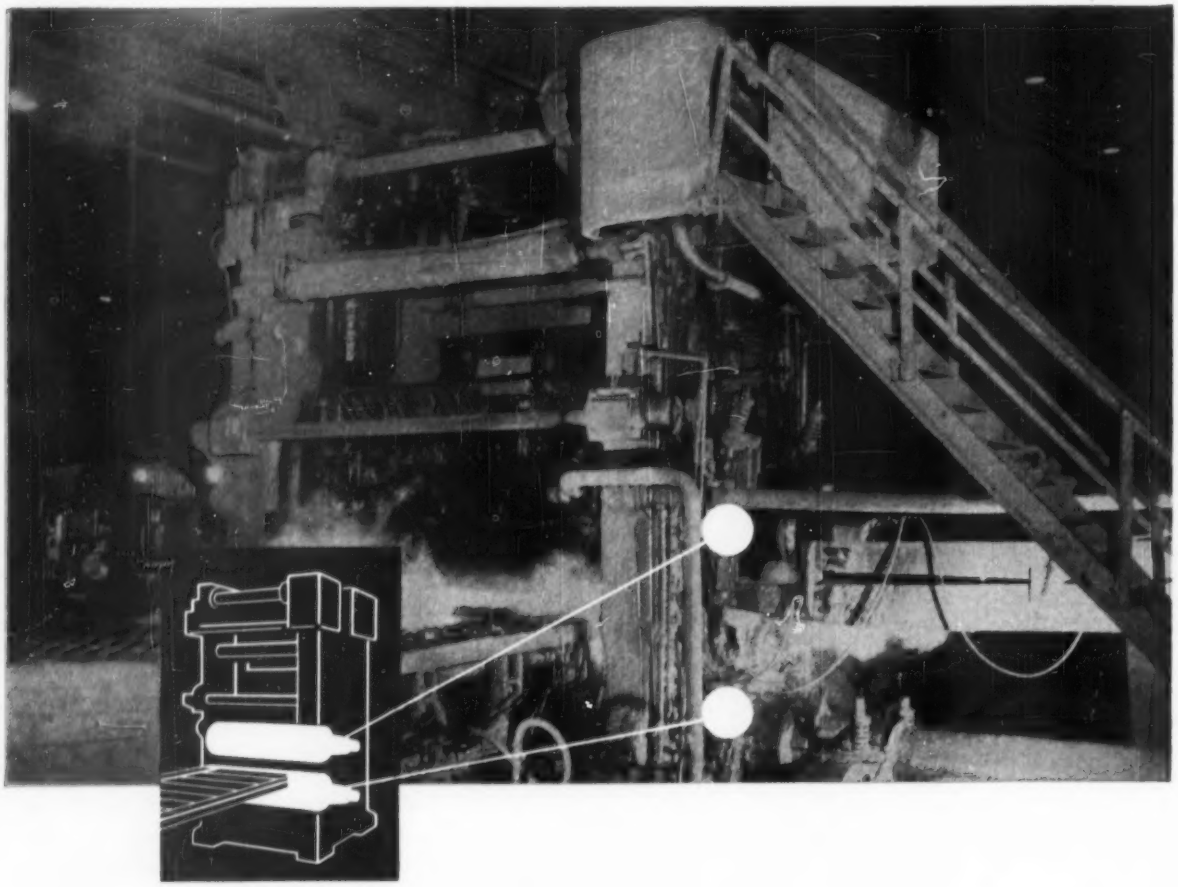
"Tighter controls on production and costs —positive control in process inventory—speed up of manufacturing cycles—better customer service and reduction in floor space requirements"—that's the story reported from a leading fastener and small parts manufacturer upon modernizing their handling system. Utilizing **Powell Tapered Nose End Dump-Hoppers,** parts now flow smoothly through production with an absolute minimum of manual labor, and a real reduction in handling costs. From the first operation, these products are transported from station to station in the hoppers, working in conjunction with large receiving bins that gravity feed into machines or, finally, into shipping containers. If you're looking for the right unit to meet specific handling requirements, check first with Powell—originator and leading producer of cold-formed, all-steel materials handling equipment.

The POWELL PRESSED STEEL CO.
HUBBARD, OHIO Dept. 996

POWELL PRESSED STEEL Since 1838

10023

Lubricating roll necks is no easy job



Lubricating the roll necks of a steel mill calls for a lubricant that will resist high temperatures. The lubricant must also function in the presence of steam, water, mill scale and other abrasive materials. It has to cushion great shock loads and cling tenaciously to the bearings it protects. It must last a long time . . . and it must be economical in use.

Atlantic Lubricant 10 performs exceptionally well in this service. It is being used in a pressure system on the mill illustrated, at the Lukens Steel Company in Coatesville, Pa., for the lubrication of roll neck bearings, pinion and spindle bearings.

Selecting the correct lubricant for the job is simplified when you call in your Atlantic Lubrication Engineer. He is a man with years of on-the-job knowledge of heavy industrial lubrication requirements of all kinds.

Why not see for yourself the value of Atlantic service? Just write, wire or phone the office nearest you for full information. The Atlantic Refining Company, Dept. R-9, 260 South Broad Street, Philadelphia 1, Pa.

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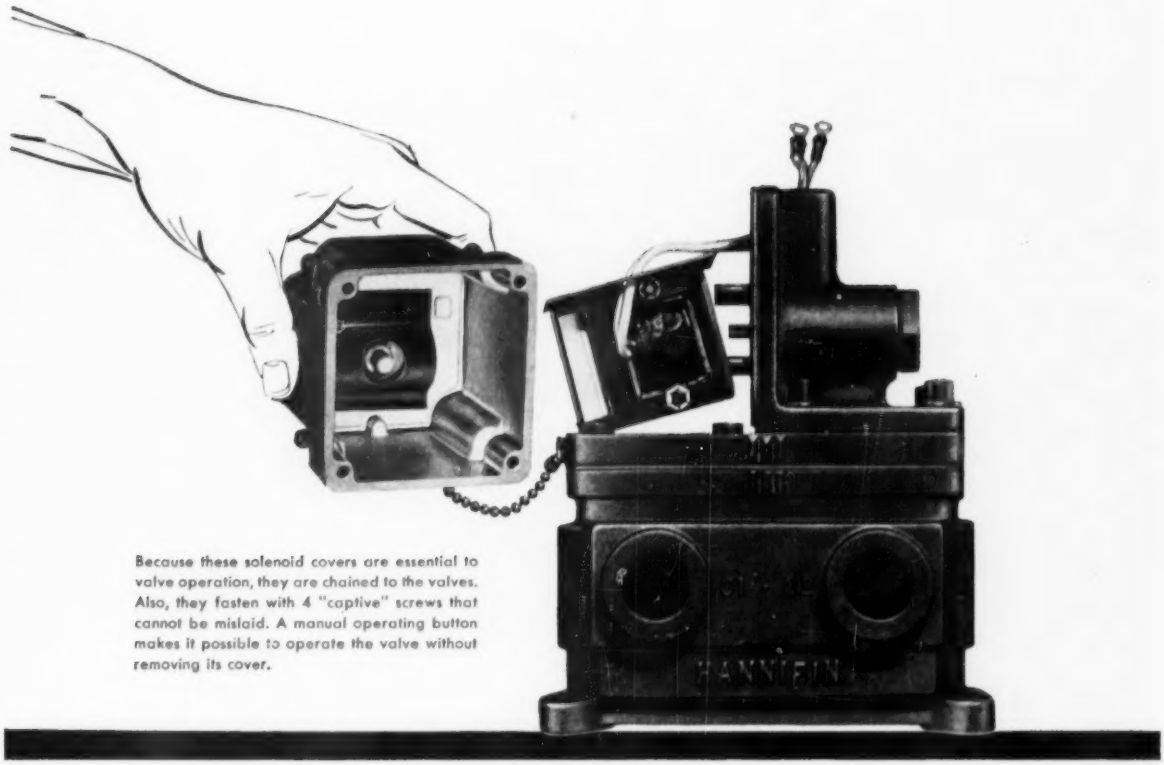


Because these solenoid covers are essential to valve operation, they are chained to the valves. Also, they fasten with 4 "captive" screws that cannot be mislaid. A manual operating button makes it possible to operate the valve without removing its cover.

Now! solenoid-controlled air valves that defy improper maintenance ...they won't operate with their covers off!

When a solenoid valve operates without its cover, trouble is not far off. Dirt, oil, cutting fluid, chips are sure sooner or later to jam the solenoid, and the valve will fail to shift.

That can't happen with these new Hannifin valves!

The solenoids are held in place by their covers and won't operate the valves unless the dust-tight, splashproof covers are firmly tightened.

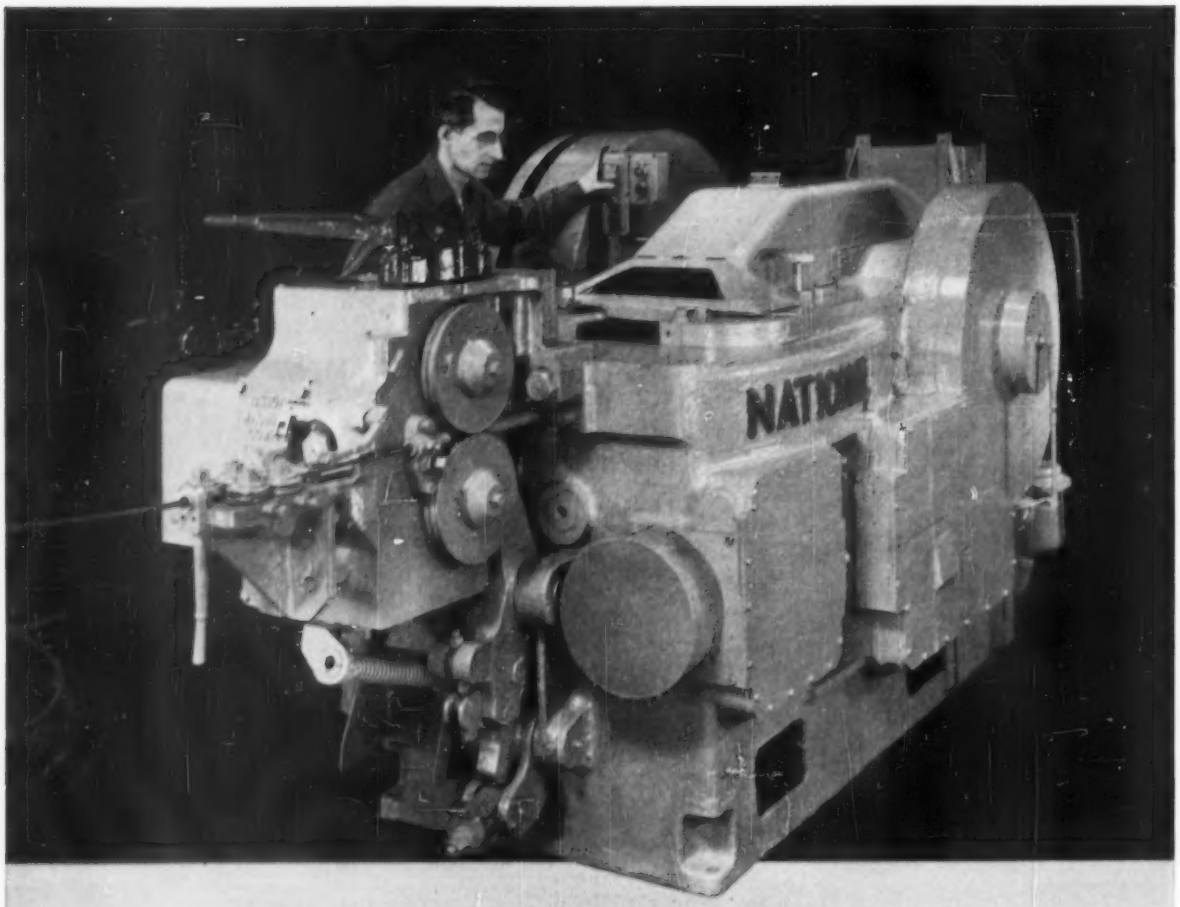
These new valves, which conform to the latest J.I.C. recommendations, are part of the complete "P-M" Pilot-Master line. New heads with these new solenoid covers are offered on 2-way, 3-way and 4-way Pilot-Master Valves (air-operated). The smaller, direct-operated 3-way and 4-way valves in the "P-M" line have been redesigned to use the same new covers. This added feature is just another reason why it pays to standardize on Hannifin air control valves.

AIR CONTROL

HANNIFIN

VALVES

Complete information on all Hannifin Air Control Valves is in this catalog. It belongs in your files. Write for your copy. Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois.



NATIONAL COLD HEADERS NOW AVAILABLE AT NEW HIGHER SPEEDS!

Standard-stroke National Cold Headers now operate at new higher speeds, as a result of dynamic counterbalancing and improved design of critical moving parts.

For example, the new ⅜" DSSD headers, like the one shown above, are producing 135 pieces per minute! Tool life is better and maintenance is still lower than on the earlier ¾" models which operated at 100 pieces per minute.

Of course, all the time-proved advantages of National Headers still apply:

1. Easier, quicker to set up and adjust.
2. Compact construction; minimum floor space.
3. Simplicity – minimum of parts and movements.
4. Rigidity – for accuracy and maintenance of adjustment.
5. Die-engineering and development assistance.

We invite you to our plant to investigate how latest-design National Headers – and other National hot- and cold-process Machinery – can bring you new advantages through the fast, automatic production of your forged metal fasteners and components.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Pick Your Special Electrodes

From Hundreds of Existing MALLORY Designs

Need odd-shaped electrodes for resistance welding around corners, inside channels, or other out-of-the-ordinary places?

Before you go to the time and expense of ordering custom-made special electrodes, see what Mallory existing designs can do for your job. We have flexible tooling available for hundreds of different odd-shaped electrodes. What you consider a "special" may well be an existing Mallory type that you can get on prompt delivery . . . and at economical cost.

Included in the Mallory line are cold formed single bend and double bend types. Also, cast and forged offset designs. You have a wide choice of nose shapes, tapers and lengths. Bent electrodes are made by an exclusive Mallory cold-forming technique which develops maximum strength and hardness, to assure long life. Both single and double bend types can be supplied with fluted cooling holes and water tubes bent in place*, to assure highly efficient cooling right up to the welding face. All types use specialized alloys and manufacturing methods which Mallory has developed during thirty years of pioneering and leadership in the resistance welding field.

Stock Mallory straight electrodes, holders, seam welding wheels, dies, forgings and castings are listed in the latest edition of our Resistance Welding Catalog. Write today for this valuable reference book . . . and see your local Mallory welding distributor for prompt delivery of high quality welding supplies.

*Patent No. 2,489,993.

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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

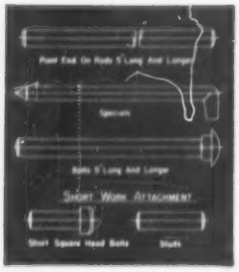
ECONOMY

TYPE "P"

Semi-Automatic Pointing MACHINE

SHORT WORK ATTACHMENT

For Pointing Bolts, Cap Screws, Studs and Rods ¼" to 1½" in Diameter that cannot be Automatically Fed.



Typical Operations Performed on Type "P" Semi-Automatic Pointing Machine.

Production rates from 480 to 1920 pieces per hour make it an ideal secondary machine for short runs on bolts or parts that cannot be automatically fed. Lower production rates available if specified.

Lag screw or cone points can be produced using the ECONOMY four cutter pointing head and suitable cam insert for long point.

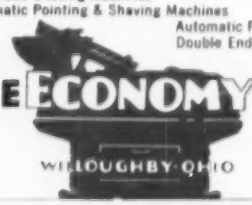
Tooling changes easily made. Wide selection of feeds and speeds.

Optional short work attachment permits handling bolts 1" to 4½" and studs to 5" length with complete operator safety.

Write for Details & Complete Information

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines
Automatic Pointing & Threading Machines
Double End Automatic Pointing Machines



THE ECONOMY ENGINEERING CO.
WILLOUGHBY, OHIO

Designers and Manufacturers of Secondary Operation Machines since 1915

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NEW

The AMERICAN MACHINIST'S HANDBOOK

Edited by
RUPERT LE GRAND
Senior Associate Editor, *American Machinist*
Based upon earlier editions of
AMERICAN MACHINISTS' HANDBOOK
edited by Fred H. Colvin and Frank A. Stanley
1579 pp., 5⅛ x 8, 774 illus., $11.00

Here's the biggest news in years for machinists, toolmakers, apprentices, designers, engineers, inspectors—in fact *all* in the metal working industry. Now you can have the on-the-job help of an *amazingly improved, fully up-to-date*, NEW AMERICAN MACHINIST'S HANDBOOK.

Long a highly-regarded working tool, this book now has been completely revised and modernized in every way to make it a practical companion for technical men. Whether it's in design and drafting—machining and forming methods—metal finishing—or other major phases of your work—your problem can be better answered, solved more quickly, easily, and dependably with the aid of the wealth of modern descriptions, practices, and data given in this book.

BIGGEST IMPROVEMENT IN NEARLY 50 YEARS!

80% rewritten
Rearranged to give more facts—easier reference.
Fully up-to-date
1579 pages
774 illustrations
45 big sections

The facts behind this monumental change

Think of the advances of recent years in metalworking in all its aspects—not only the normal development of better tools and techniques in an important industry, but also the further advances demanded by work on new materials and new design applications! *The growth in metal working technology, standards, and practice has been tremendous* — faces every man in the field with a great need for new working information. To meet this urgent need, the NEW AMERICAN MACHINIST'S HANDBOOK has been created — fully abreast of today's practice—and given to you with the practical treatment and handy reference features that will make this the "bible" of the industry for many years.

Gives day-to-day help in your work

The NEW AMERICAN MACHINIST'S HANDBOOK is so concisely written, so logically arranged, so packed with facts, that you'll find it of almost daily use in your work. Look up in it questions, large and small, on layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances, forming and finishing methods—hundreds of details of machine shop and drawing room practice. You'll find the authoritative answers that will mean time and money saved and better results in all your work. See for yourself—have the book at your elbow—consult it for 10 days at our risk. No obligation to keep it unless it meets your needs. Just mail the coupon below.

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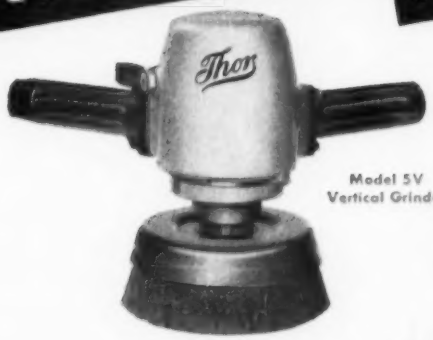
NEW! THREE THOR AIR GRINDERS

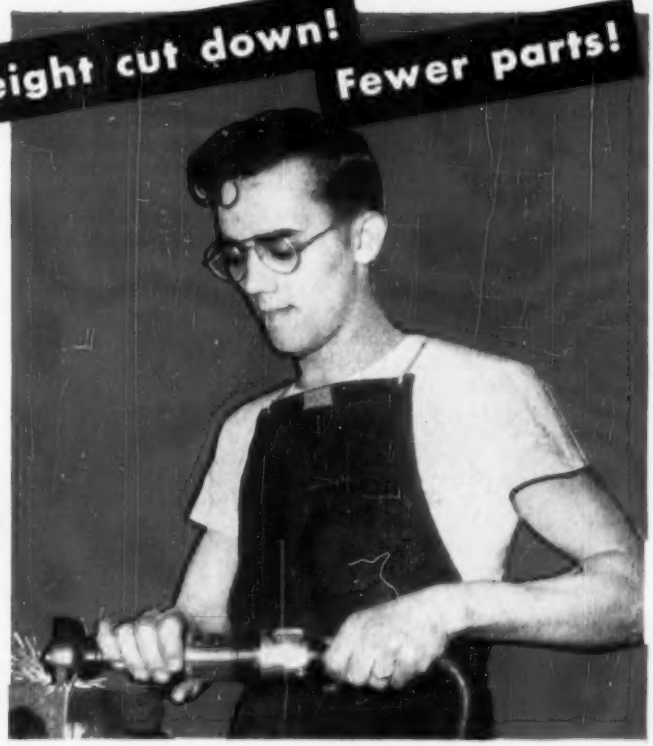
Power stepped up! **Weight cut down!** **Fewer parts!**



Model 5V
Vertical Grinder

Model 25G Die Grinder

Series 3G Grinders for Castings



All three of these brand new additions to Thor's complete grinder line represent distinct progress in power, in weight reduction, and design improvement. All have thumb-type throttle control.

Model 5V Vertical Grinder

This new Thor 7½-lb. vertical grinder is available in three basic speeds — 4,500, 6,000, or 8,000 r.p.m. It accommodates sanding discs to 9″ diameter, depressed center wheels to 7″ diameter, and cup wheels or wire brushes to 6″ diameter. Power has been increased 50%; quiet exhaust; 4-position throttle.

Model 25G Die Grinder

Designed for use with a 1¾″ bonded wheel in die work and other production operations, this new Thor Model 25G weighs only 2 lbs., 37% less than its Thor predecessor, yet it develops 23% more power! Model 25G also has 35% fewer parts. Speed: 20,000 r.p.m.

Thor
PORTABLE POWER
TOOLS

Model 3G Series for castings

Available in speeds of 7,000, 10,000, 15,000, and 18,000 r.p.m., this new Thor Series 3G takes wheel sizes from 1½″ to 3″, depending on speed. Here, again, the weight has been cut to 3 lbs., 11 oz., a saving of 16%, while power has been increased 18%. Also available in Series 3GE with an extension spindle to reach hard-to-get-at places.

Thor's complete line of air, universal electric, and high frequency electric grinders includes sizes, speeds and capacities for every industrial need. Thor also offers a complete line of grinder accessories. Thor Power Tool Company.

THOR POWER TOOL COMPANY, Aurora, Ill.

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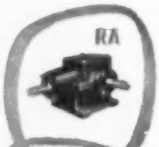
Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.



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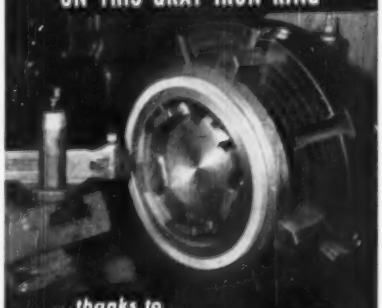

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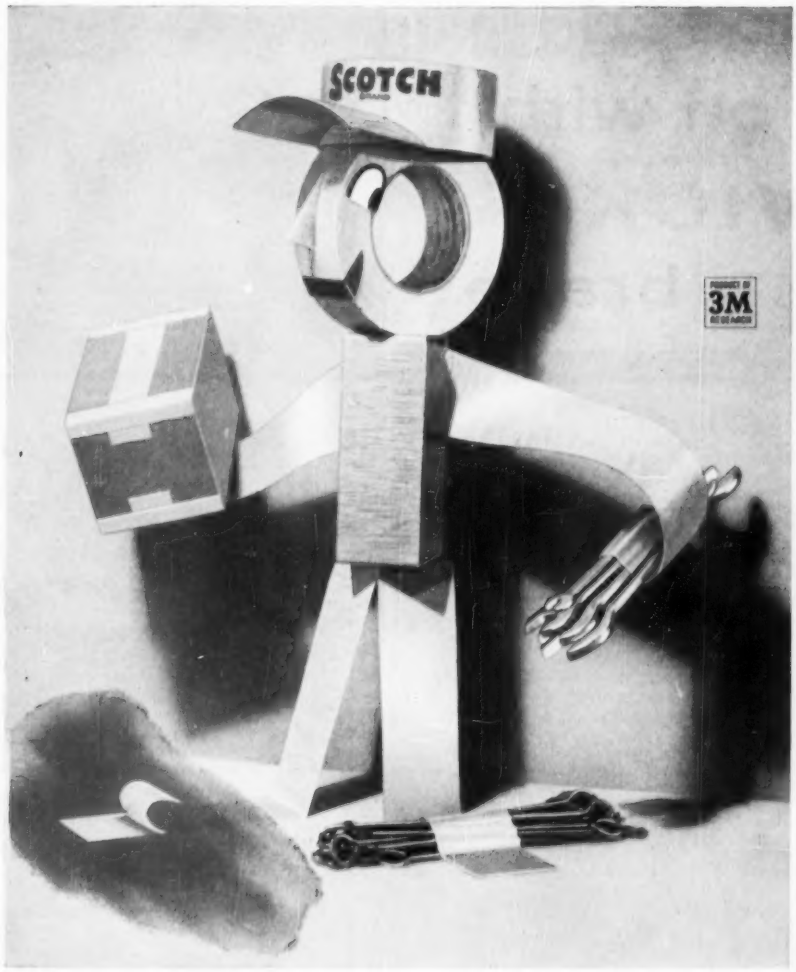

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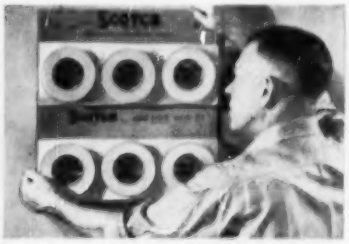

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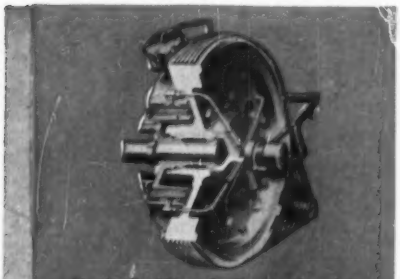

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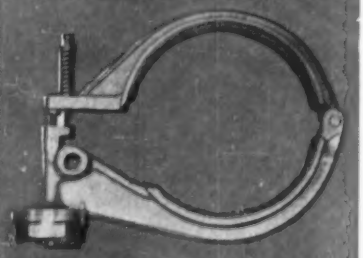

CS Brake: Spring-engaged and air-released . . . adjustable for degree of braking . . . used for holding or on cyclic applications where dependable spring-applied self-energizing brake is desirable.

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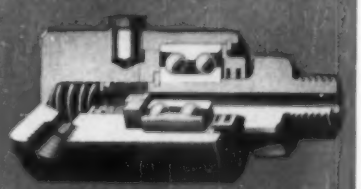

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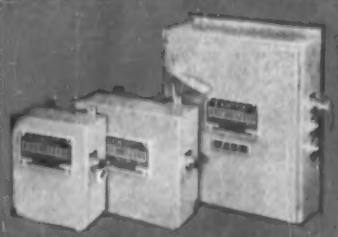

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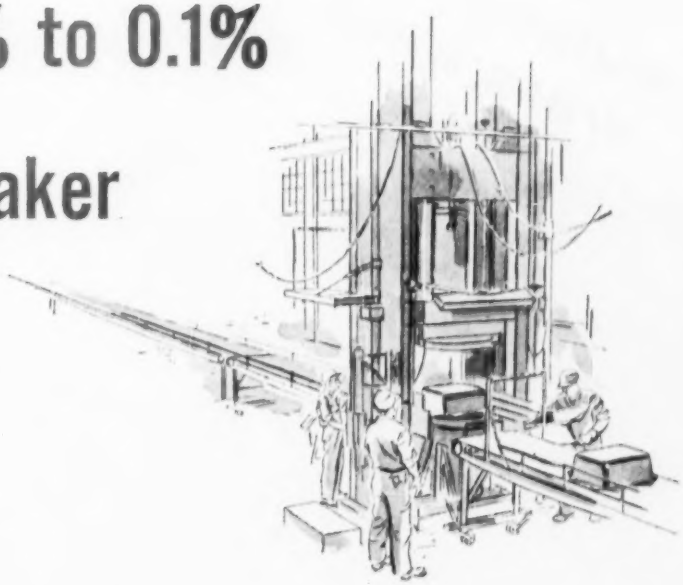

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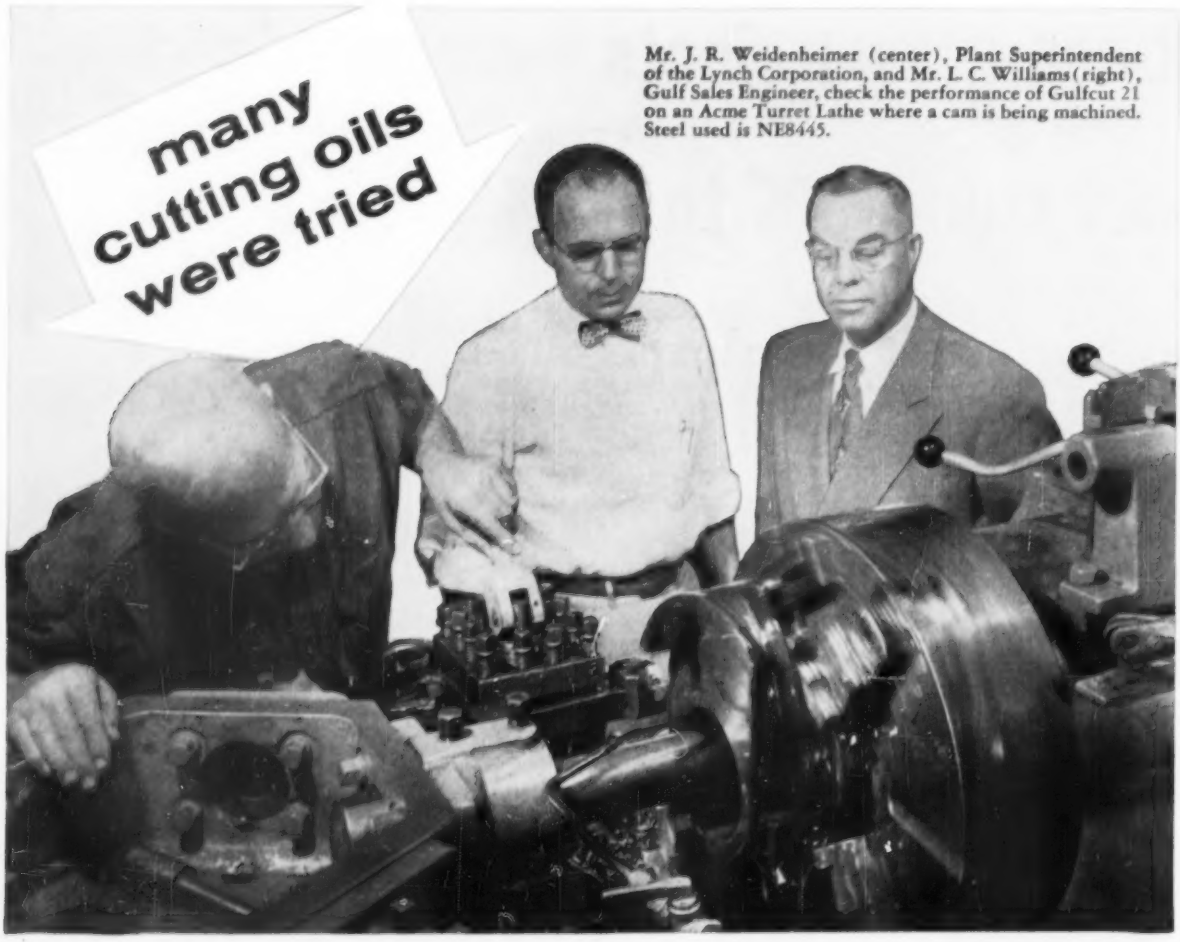

Mr. J. R. Weidenheimer (center), Plant Superintendent of the Lynch Corporation, and Mr. L. C. Williams (right), Gulf Sales Engineer, check the performance of Gulfcut 21 on an Acme Turret Lathe where a cam is being machined. Steel used is NE8445.

. . . GULFCUT 21 was chosen

by the Lynch Corporation, Anderson, Indiana

"We did not choose Gulfcut 21 at random," says Mr. J. R. Weidenheimer, Plant Superintendent of the Lynch Corporation, well-known glass machinery manufacturer. "Many different cutting oils were tried but Gulfcut 21 proved best in our tests. We feel that it gives better protection to the tool and contributes to a smoother machining operation."

Scores of machine shops have discovered, as the Lynch Corporation did, that Gulfcut 21 is the answer when the job calls for a sulfurized mineral type cutting oil.

One important reason for the outstanding performance of Gulfcut 21 is a special Gulf process of combining sulfur. This provides greater sulfur activity over the entire range of a cutting operation—gives the tool maximum protection and helps to reduce built-up edge. Gulfcut 21 also has excellent anti-weld characteristics and extreme load carrying ability.

Gulfcut 21 is only one of the complete line of quality GULFCUT oils that will help you get improved prod' ction and longer tool life in all your machining operations.

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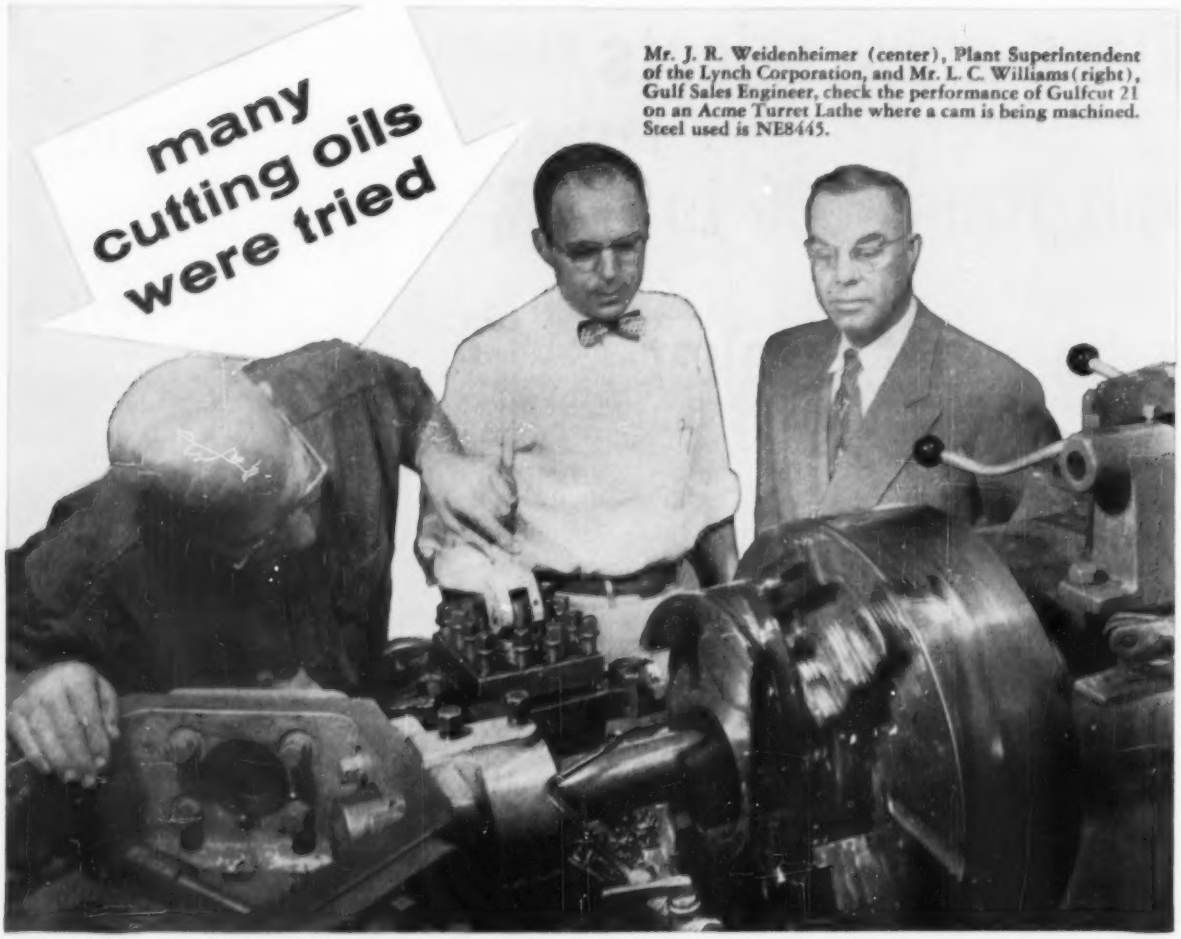

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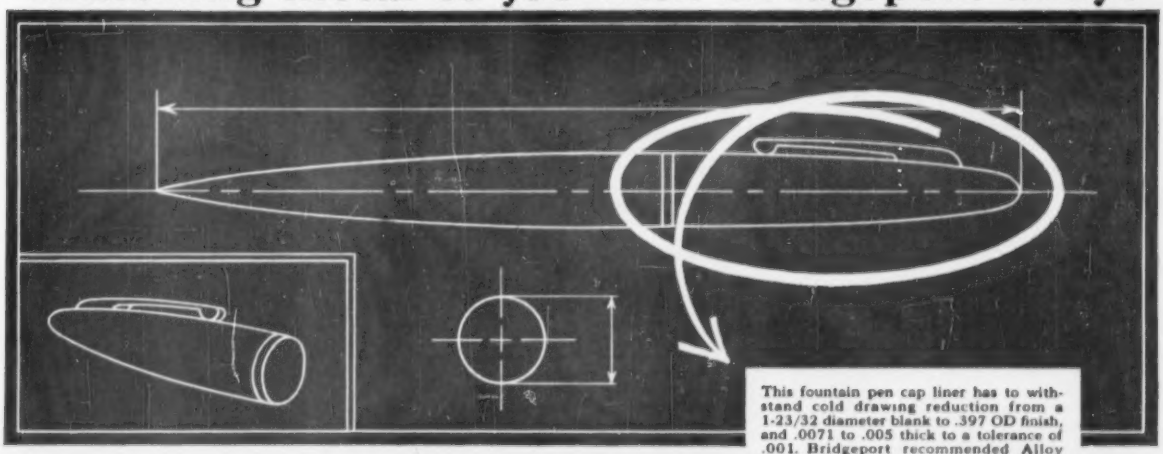

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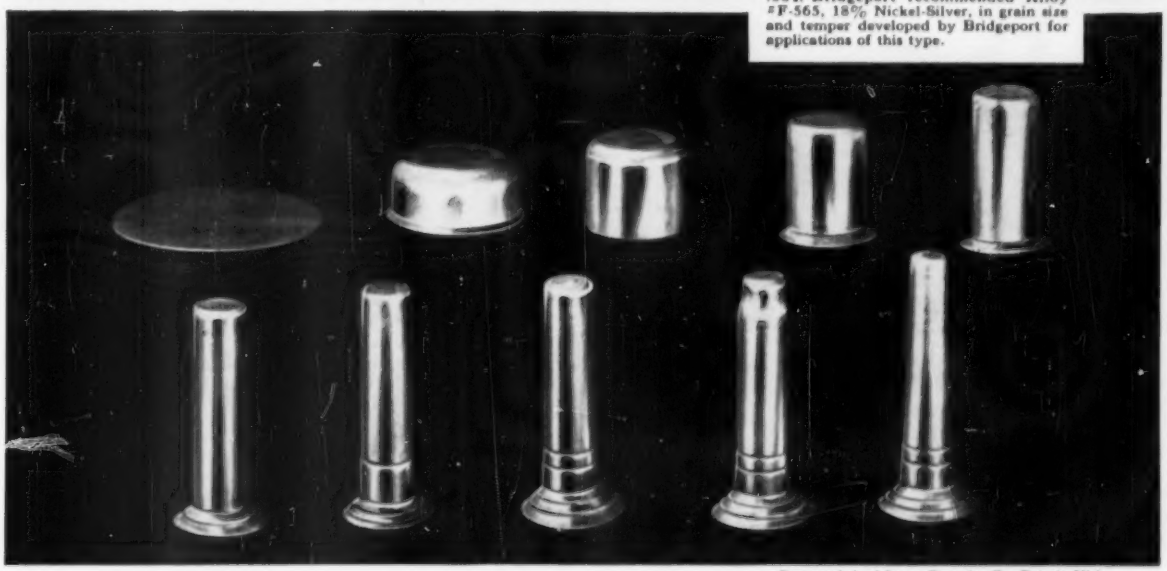

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Water Pump Cover	6	12 drilling 2 milling 3 boring 2 chamfering 4 reaming 1 counterbore	TOTAL 24	177 pcs./hr.
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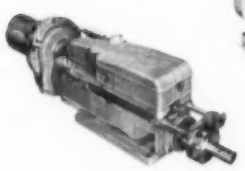
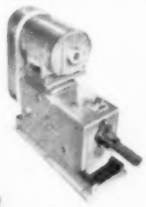
Refrigeration Compressor Cylinder Housing	18	4 milling 19 drilling 11 burring 4 counterboring 3 reaming 3 spotfacing 10 tapping 3 boring 1 chamfering	TOTAL 58	120 pcs./hr.

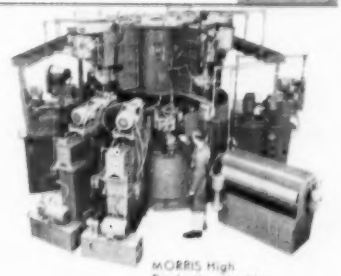
MORRIS Automatic Drilling Units



AIR-OIL-MATIC



CAM-MATIC



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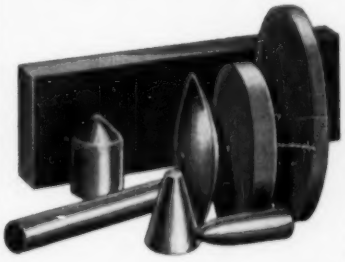

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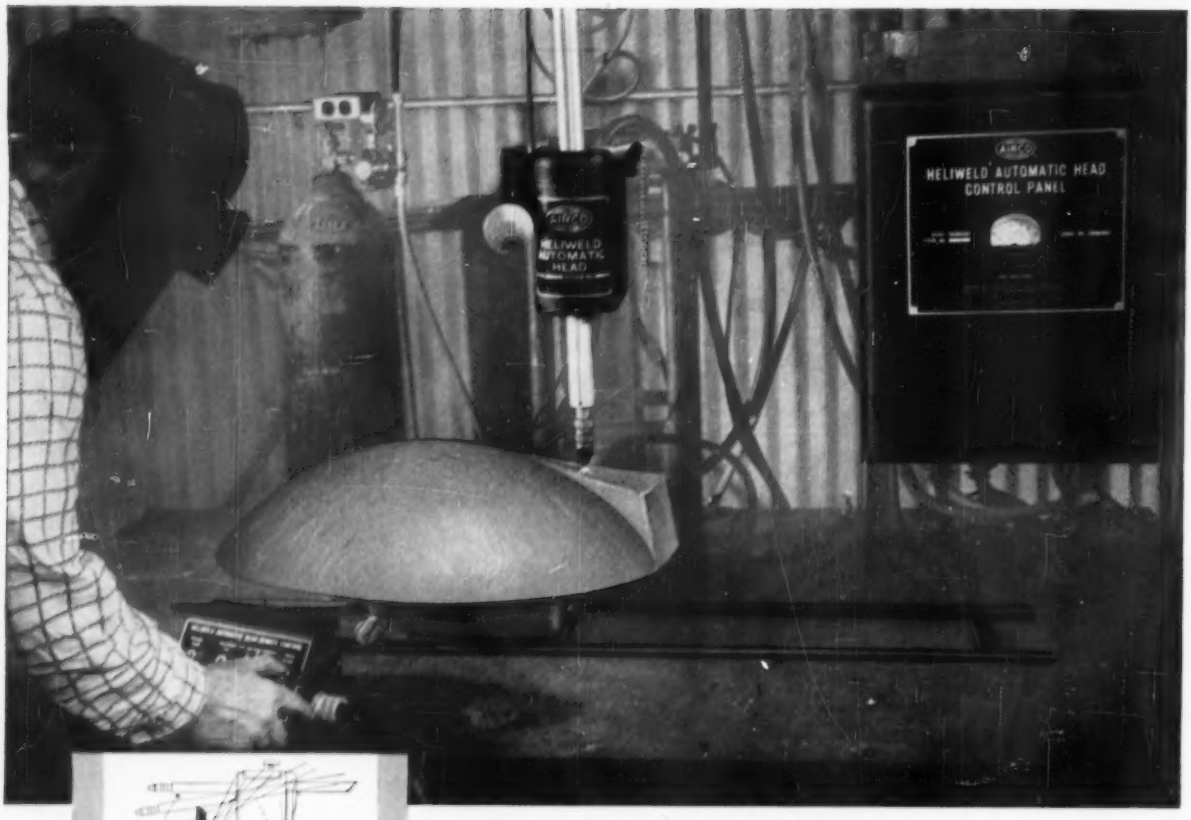

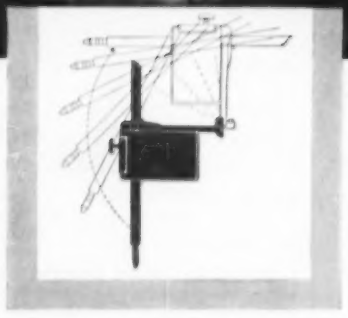

New Airco Model C Heliweld automatic head operates at all angles from horizontal to vertical.

Airco introduces New Automatic Heliweld Head for long-run production welding

The Model C Heliweld automatic head is specifically designed for long-run production on regular or irregular contours – aluminum tubing, motor stators, irregularly-shaped pressure vessels. Its prime advantage is that once the required arc length is set the head will automatically maintain this distance by moving the holder up or down to follow the contours of the work piece. Other benefits are:

- **Versatility** – unit provides good arc voltage control using either argon or helium shielding gases or mixture of both.
- **Adaptability** – the head can be operated at all angles from the horizontal to the vertical (normal) position. The maximum raise-lower distance of the electrode holder is a full 16".
- **Flexibility** – the assembly can be used for AC or DC welding, with or without filler wire. Electrode diameters range from .020 to ⅛".

The use of the new automatic head will be required where welds of consistent dimensions and quality are important and where good weld appearance is necessary or where welding specifications are very high for the electrical, aircraft, and refrigeration industries. Complete information covering the wide range of applications and detailed specification data is available. Write Airco at the first opportunity.

welding
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AIRCO®
Offices in most principal cities

AIR REDUCTION SALES COMPANY
A division of Air Reduction Company, Incorporated, New York 17, N. Y.

WELDING SHOW — VISIT OUR BOOTH

On the west coast –
Air Reduction Pacific Company

Internationally –
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In Cuba –
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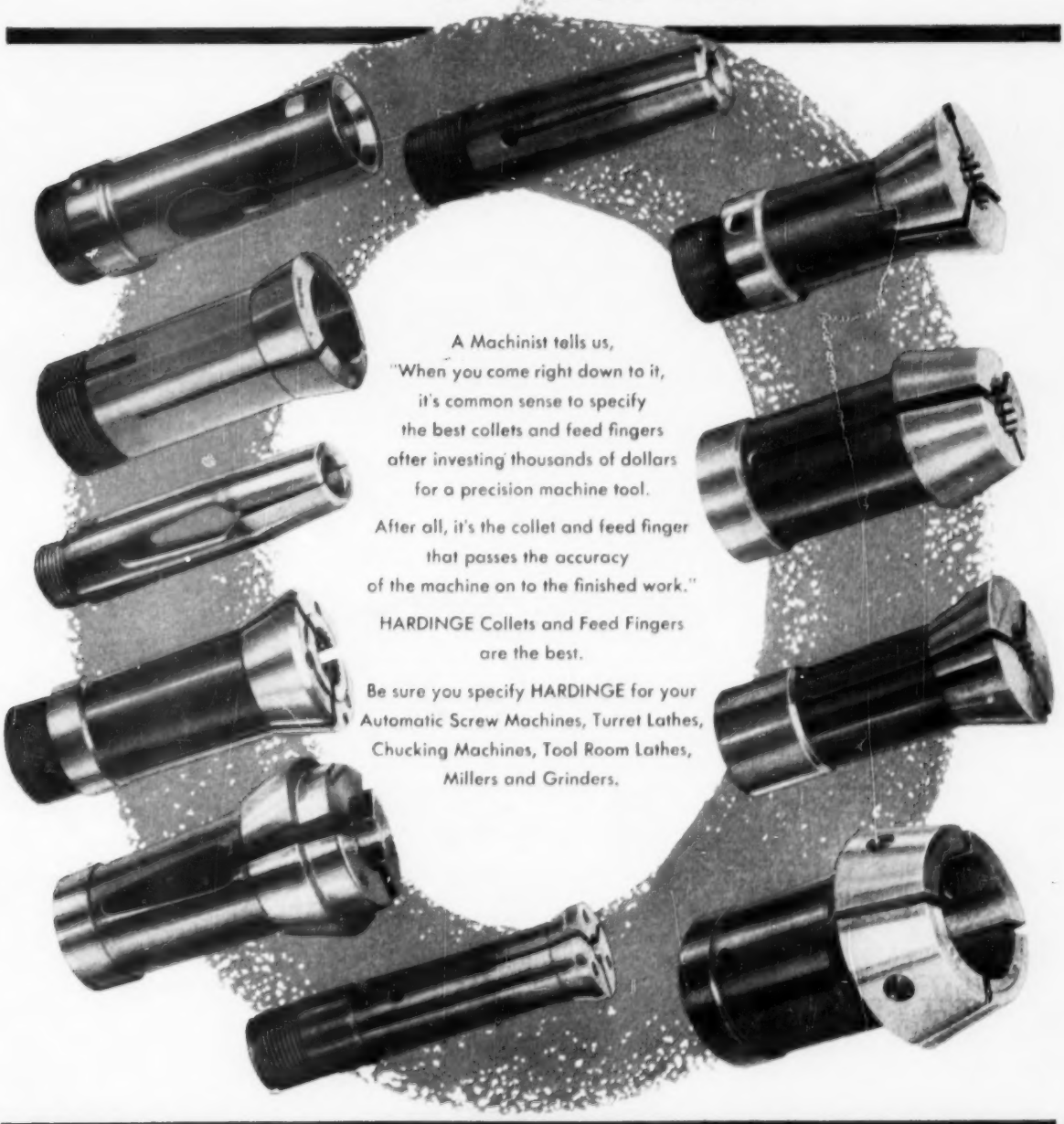
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** – industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** – carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** – medical gases and hospital equipment • **NATIONAL CARBIDE** – pipeline acetylene and calcium carbide • **COLTON** – polyvinyl acetates, alcohols, and other synthetic resins.

Specify **HARDINGE**

Collets and Feed Fingers

and *Get the MOST from your Investment in Machine Tools*



A Machinist tells us,
"When you come right down to it,
it's common sense to specify
the best collets and feed fingers
after investing thousands of dollars
for a precision machine tool.

After all, it's the collet and feed finger
that passes the accuracy
of the machine on to the finished work."

HARDINGE Collets and Feed Fingers
are the best.

Be sure you specify HARDINGE for your
Automatic Screw Machines, Turret Lathes,
Chucking Machines, Tool Room Lathes,
Millers and Grinders.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Elmira, Dayton, Chicago, Minneapolis, St. Louis, Detroit, San Francisco, Los Angeles, Philadelphia, Hartford, New York.

WHAT'S AHEAD?
...AM's New Packaged Planning

NEW YORK—A Buyer's Guide listing over 7000 sources of supply for the production equipment, materials, parts and supplies needed by American Machinist's subscribers will be incorporated into the 1957 Production Planbook issue due to be mailed to subscribers in November.

The Buyer's Guide section will list under more than 1400 headings, the names of manufacturers of the entire gamut of products used by Metalworking plants—from fasteners to big production machines—from sheet steel to electric motors.

Formerly a regular feature of *American Machinist*, the Buyer's Guide was discontinued during World War II. It is now resumed in expanded, complete, and authoritative form, providing an exclusive "Where-to-Buy-it" service for *American Machinist* subscribers.

Other Subscriber Values

Production "Nuggets" usually found in previous Production Planbook issues, and which have proven so useful, will be another major feature. These are the essence of the production ideas published in regular issues of *American Machinist* throughout the year. They are classified by subject matter, with issue dates and page numbers for easy reference to articles and reports—of interest to subscribers who want more specific details with drawings, diagrams and illustrations.

"Developments to Watch in '57," an innovation this year, will give subscribers a check-list against which to measure procedures and requirements of their shops, compared with the latest production ideas and techniques—challenging to every Metalworking production executive and engineer.

Easy to Use

Flat-opening, thumb-indexed and classified by topic, *American Machinist's* 1957 Production Planbook and Buyer's Guide Issue is organized into 11 idea-stimulating sections for year-round usefulness:

- **1957 Outlook** — for Production Planning Ahead.
- **Section A** — Management and Personnel Developments.
- **Section B** — Machining. Metal-removal techniques and production equipment required; automation devices and methods; cutting fluids, grinding wheels; and other elements associated with removing metal.
- **Section C**—Tooling. Articles devoted to the jigs, fixtures, dies, holding devices and press tools used in conjunction with metal removal and metal forming production equipment.
- **Section D**—Presswork, Molding,

1957 Production Planbook and Buyer's Guide Issue to contain everything you need to plan ahead

- **Need new modern production equipment?**
- **Planning increased production at less cost in '57?**
- **How can you use automation?**
- **What about new materials and how to work them?**
- **Puzzling over commercial parts and supplies?**

For real production help depend on AM's 1957 Production Planbook and Buyer's Guide Issue due Mid-November 1956

is a Metalworking First

Casting. Everything reported during 1956 on forming metals, with the necessary equipment, accessories, and tools.

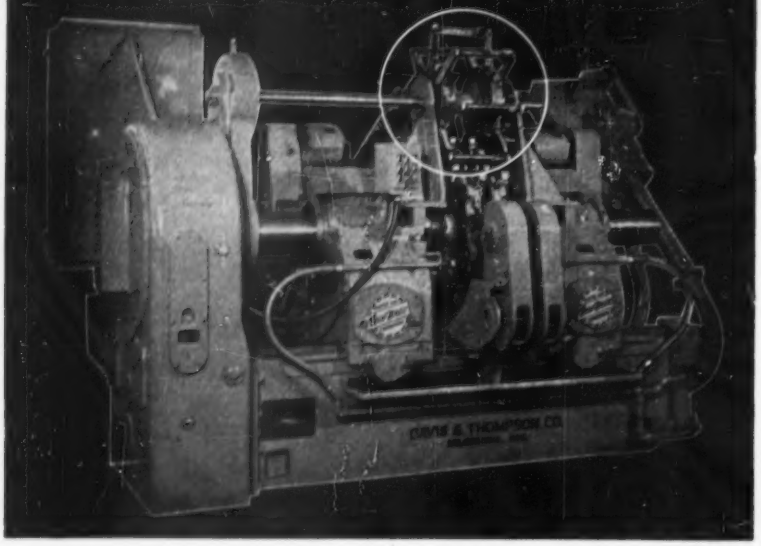
- **Section E**—Inspection, Testing, Quality Control. 1956's developments in a highly interesting, problem-in-every shop group of topics, all rounded up in a single reference section.
- **Section F** — Assembly, Heat-Treat, Finishing. "How-to-do-it" production ideas covering the year's reporting of assembly, heat-treating and finishing techniques and equipment, including hand and portable power tools.
- **Section G** — Materials, Components. New materials of manufacture; new developments in the use of existing materials; what others are using for specific applications; pneumatic and hydraulic mechanisms and attachments; and gears, parts, valves, and other components.
- **Section H**—Materials Handling, Services. "How-to-move-it" fork-lift & conveyor, crane-hoist and other materials handling information, as well as new developments in automation not elsewhere covered. Also covers inventory and work-in-process control systems; disposal, reclamation and exhaust ideas.
- **Section I**—Prize Ideas, Rebuilt Equipment
- **Section J**—Buyer's Guide

Three-Fold Usefulness

Published as an additional unique editorial service without extra charge to subscribers, *American Machinist's* 1957 Production Planbook and Buyer's Guide Issue is a complete reference issue of "How-to-do-it," "Where-to-buy-it," and "What-to-do-it-with" ideas for Metalworking production executives and engineers now in its fifth successful year.

1957 OUTLOOK	
MANAGEMENT, PERSONNEL	A
MACHINING	B
TOOLING	C
PRESSWORKING, MOLDING, CASTING	D
INSPECTION, TESTING, QUALITY CONTROL	E
ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS)	F
MATERIALS, COMPONENTS	G
MATERIALS HANDLING, SERVICES	H
PRIZE IDEAS, REBUILT EQUIPMENT	I
BUYER'S GUIDE	J

...Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

6460 N. 124th St. MILWAUKEE 10, WISCONSIN

BENDING BLOCKS or WELDING PLATENS

Semi-steel Blocks for layout, welding, assembly work, etc., with machined working surfaces; also tools and accessories, including a full line of clamps, drift pins and dogging devices. Standard and special stands can be supplied. A 4-unit set-up, joined and mounted on stands, is shown above.

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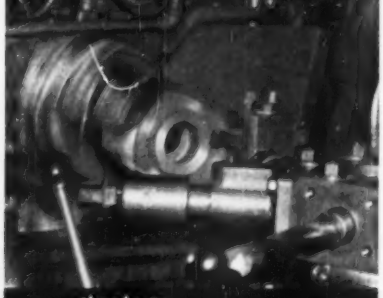
UNIT MACHINING COST CUT 17% ON THIS GRAY IRON CASTING



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Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 12, Niagara Falls, N.Y.

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Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

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This newest ARMA StARMArine Gyro-Compass—1/50 the size and 1/20 the weight of its predecessors—has achieved near-total elimination of friction—for precision navigation. Ball bearings used in its control parts must be as friction-free as modern science can produce... Federal Ball Bearings, of course!

so much of industry *turns* on FEDERAL ball bearings

Guiding man by sea, air or land! Or yarn from bobbin to cone! On sunny farms or in busy machine shops, you'll find Federal Ball Bearings. Because, wherever anti-friction work is to be done, Federals are on the job! Hundreds of makes—12,000 sizes—all produced by a 50-year-old maker of ball bearings *exclusively*.

When Federal Ball Bearings are part of so many things you *use*, shouldn't they be part of the things you *make*?

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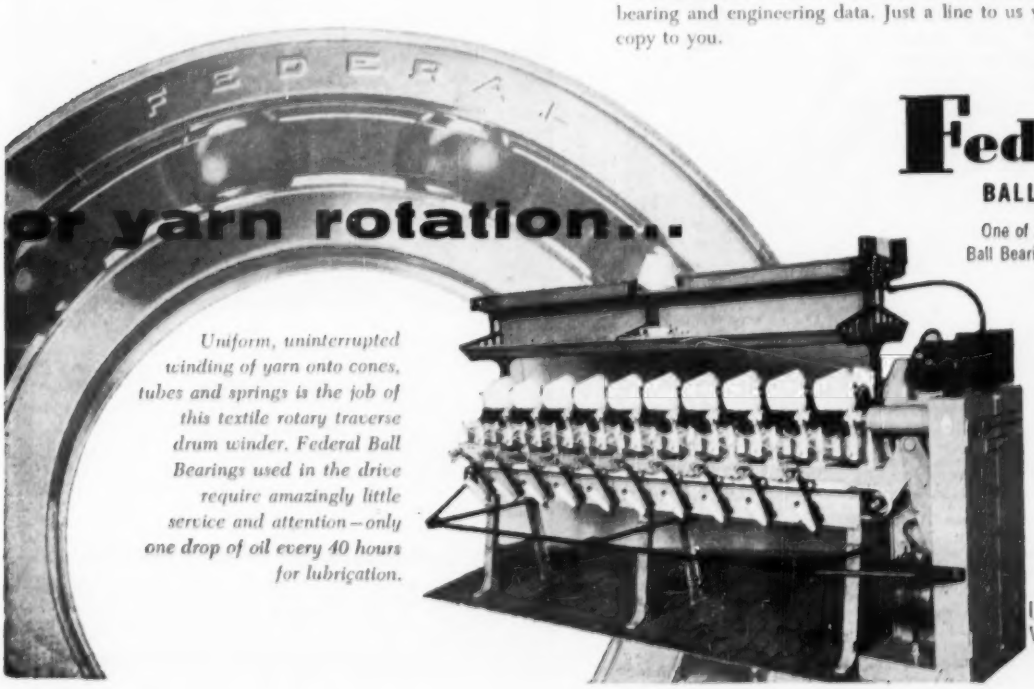
Get FEDERAL'S NEW CATALOG! With 175 pages of ball bearing and engineering data. Just a line to us will speed your copy to you.

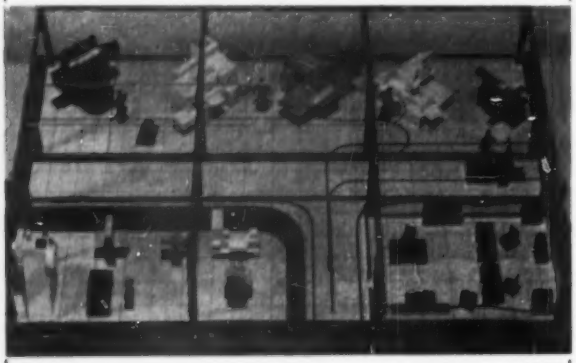


Uniform, uninterrupted winding of yarn onto cones, tubes and springs is the job of this textile rotary traverse drum winder. Federal Ball Bearings used in the drive require amazingly little service and attention—only one drop of oil every 40 hours for lubrication.

Universal Winding

Federal
BALL BEARINGS
One of America's Largest Ball Bearing Manufacturers

MODEL COSTS CUT IN HALF!



Models now cost *less* than most home made templates. Now you can get a new type of layout model containing only essential detail (no "gingerbread") and costing half as much as heavily detailed models. New cost is 2¢-4¢/sq. ft. of plant depending on congestion and size. These simplified models are available in various scales: ⅛, 3/16, ¼, ½" to the foot.

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Also

New York
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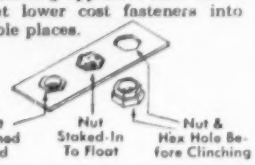
industrial models, Inc.

A team of engineers & craftsmen

use these
GRIPCO CLINCH NUTS
with the exclusive
hex on hex
feature

for "fixed" fastenings for "hard-to-reach" or blind assemblies. They wear longer, hold tighter, give greater customer satisfaction.

See how leading appliance manufacturers get lower cost fasteners into inaccessible places.



Gripco Clinch Nuts can be either clinched solid for a rigid application or staked in with a six point staking punch to give a floating effect. This floating effect takes care of misalignment and makes the application of the bolt easier. Gripco clinch nuts can be clinched or staked with stationary or portable hydraulic or air equipment. Details on request. Write for samples and data sheet.

Typical Applications

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EASY MATH. AT YOUR FINGER TIPS SAVE TIME AND MATERIAL

USING THESE EQUATION CHARTS YOU CAN CALCULATE IN HIGHER MATHEMATICS. NO PREVIOUS TRAINING NECESSARY.

Thousands of these charts used by draftsmen, tool, die and jig makers, machinists, students, inspectors, template makers and designers. Each chart has instructions to SHOW YOU HOW TO DO IT.

PLANE ANGLES
TRIG-EASY chart for plane angles and dimensions (as shown) POSTPAID 50¢

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TRIG-EASY chart for spherical angles and dimensions POSTPAID 75¢

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TRIG-EASY complete set 3 charts and instructions for plane, spherical and compound angles in a container.
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TRIG-EASY chart with pocket manual over 140 pages, 60 drawings, 6 decimal trig. function table for compound angles and dimensions in machine set up etc.
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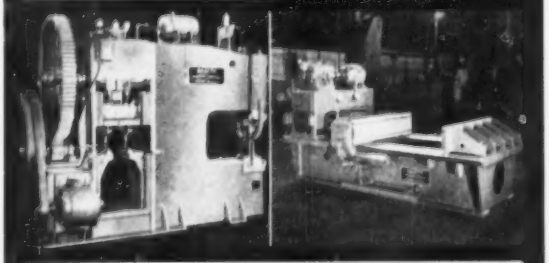
SOLD NATIONALLY BY EUGENE DIETZGEN CO.

production problems?
better check . . .

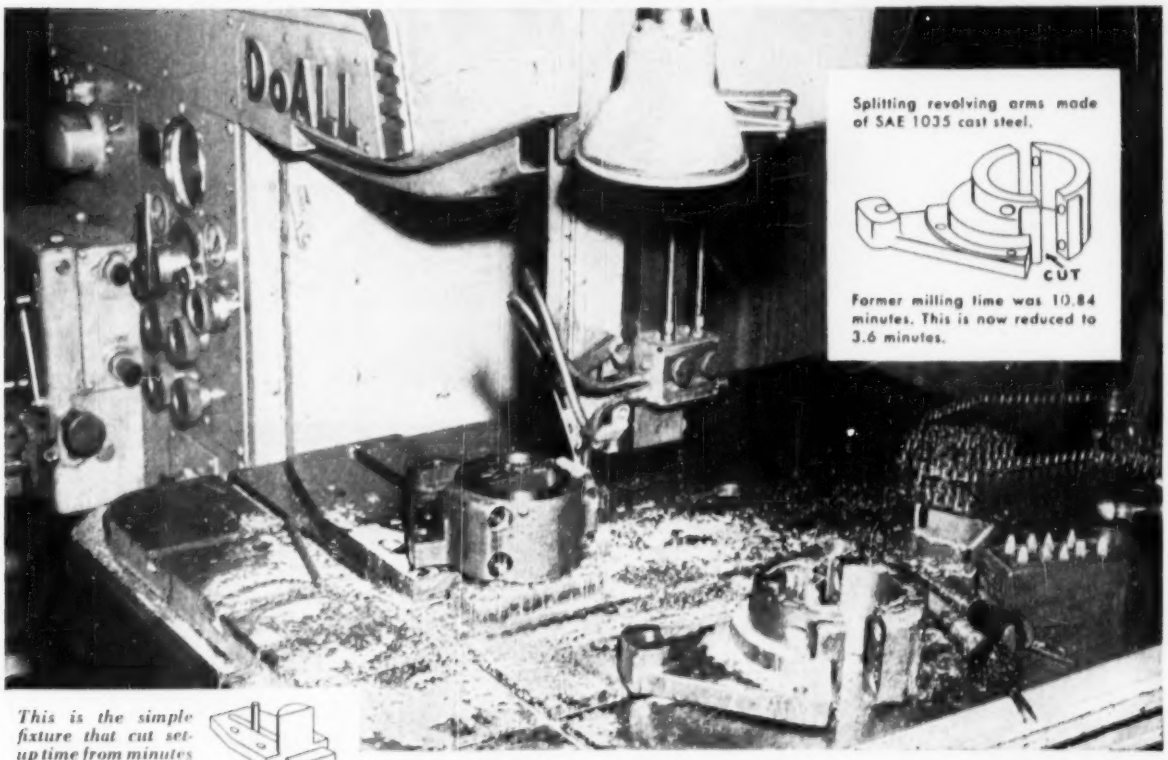
BEATTY
METAL WORKING EQUIPMENT



DETAIL BEAM PUNCH (left) — Punches I-beams in just 3 passes instead of the usual 5, eliminates end-for-end turning of beams. Speeds single-hole web and flange punching. 100-ton cap.; 1¼" hole through 1" material. **HORIZONTAL HYDRAULIC BULLDOZER** (right) — For forming, bending, straightening — rapid production and return speeds boost output: advance — 262" per min.; press — 29" per min.; return — 385" per min.

Write: BEATTY MACHINE & MFG. CO. 948 150th STREET, HAMMOND, INDIANA

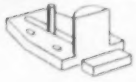
How Production Band Machining Cuts Splitting Costs

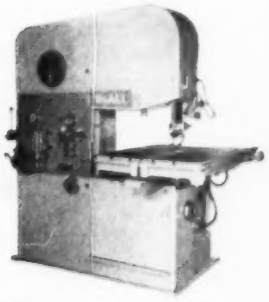


Splitting revolving arms made of SAE 1035 cast steel.

Former milling time was 10.84 minutes. This is now reduced to 3.6 minutes.

This is the simple fixture that cut set-up time from minutes to seconds.





This is the Contour-matic which doubled production with a carbon steel blade.

This is the Demon H.S.S. blade that boosted production 3 times greater than originally done on a milling machine.

Faster Cutting and Reduced Setup Time Increase Production

Literally thousands of splitting operations now being performed by other methods can be done at lower costs with DoALL production band machines.

For example, at one company, the number of "revolving arms" split in an 8-hour day jumped from 44 to 84 when band machining replaced the previous machining method... and when Demon high-speed steel blade was used instead of carbon steel saw band, production rose to 133 a day. Accuracy and finish were excellent, well within tolerances.

The inexpensive, exceedingly simple fixture used is typical of those required for band machining. Hold-down elements are unnecessary as the work is clamped to the table by the downward cutting force of the blade. DoALL offers a complete band machine fixturing service and provides design sketches free of charge.

If you do production splitting and slotting, it will pay you to call your local DoALL Sales-Service for a free demonstration in your plant, or write:

THE DoALL COMPANY, Des Plaines, Illinois

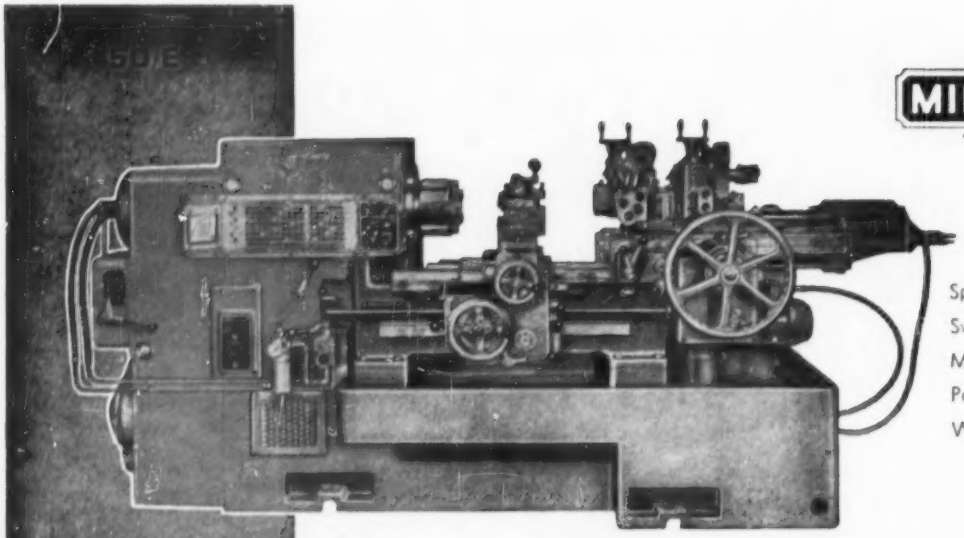
DoALL

FREE LITERATURE AND MOVIES—The new 16-page saw band catalog and the new contour-matic catalog are now available as well as two sound-color movies for group showings—"Production Band Machining" (30 min.), and "Production Tooling" (10 min.).

Friendly DoALL Sales-Service Stores in 38 cities—call yours today!

PB-30

MINCANTI



AUTOMATIC
"CAMLESS"
TURRET LATHE

Spindle bore	2 1/4"
Swing	18"
Max speed	rpm 3000
Power	HP 8
Weight	lbs. 6000

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Exclusive Distributors for the U.S.A.: Sales Service Parts
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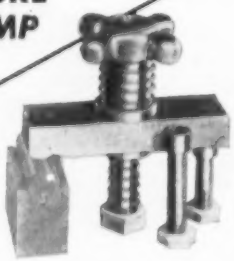
New SWINGLOCK One-Hand Operated FIXTURE CLAMP

Note these features:—

1. RAPID OPERATION a half turn of the hand knob loosens strap and turns it 90 degrees completely eliminating unnecessary turning of knob.

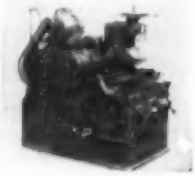


2. SELF POSITIONING horizontal, vertical or upside down—strap will not fall out of position even in unclamped position.

3. WIDER APPLICATION—SWINGLOCK can be operated in restricted areas where there is not enough room for forward and backward strap movement.

Write for bulletin
TEMPLATE SHEETS AVAILABLE
MAKES FOR HIGHER PRODUCTION

WEST POINT MANUFACTURING CO.
26937 W. 7 MILE ROAD • DETROIT 19, MICHIGAN



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All sizes up to 14" capacity, with and without automatic stock feed
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Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
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23018 North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

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for economical manufacturing of all profiles that can be generated, as:

EXTERNAL- AND
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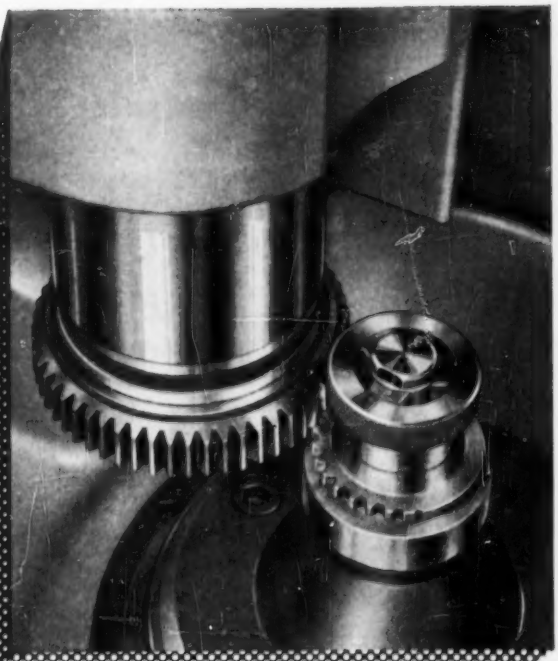
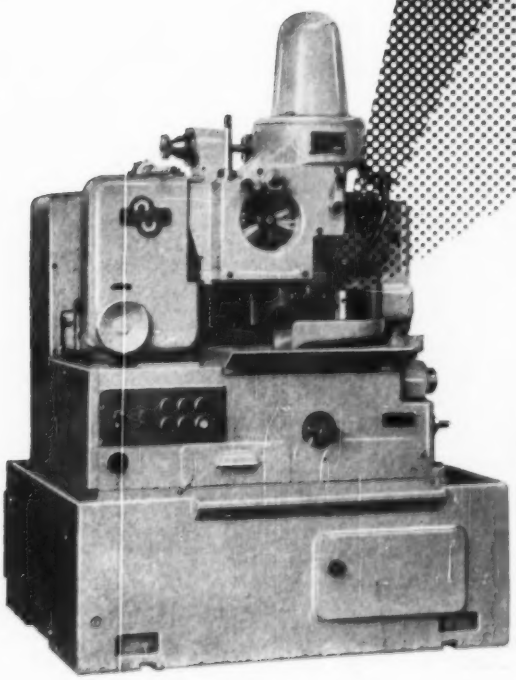
RACKS
CROWN WHEELS
RELIEF SHAPING
CLUTCH GEARS





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GEAR HOBBING MACHINES

in progressive development
for more than 60 years

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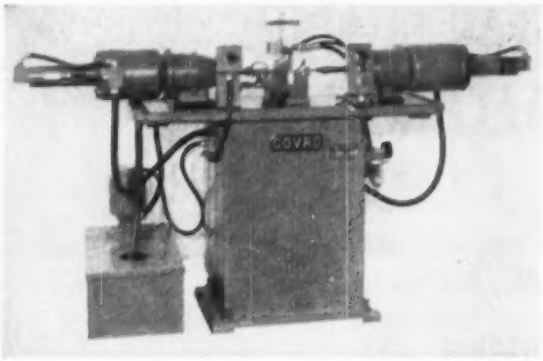
New Automatic Centering Machine

A way to perform centering operations at a high production rate has been developed in this new machine which incorporates two Govro-Nelson Automatic Drilling Units and was specially designed for centering a marine motor cam shaft.

The operator loads the part into a fixture and depresses the start cycle switch, whereupon the work is automatically clamped, centered at both ends and unclamped, ready for the operator to remove. Output rate: Approximately 360 pieces per hour.



If you have similar operations and would like to speed up your production rate, we shall be pleased to recommend the proper Automatic Units or quote on a complete set-up. Complete information sent upon request.

WRITE FOR *Literature*

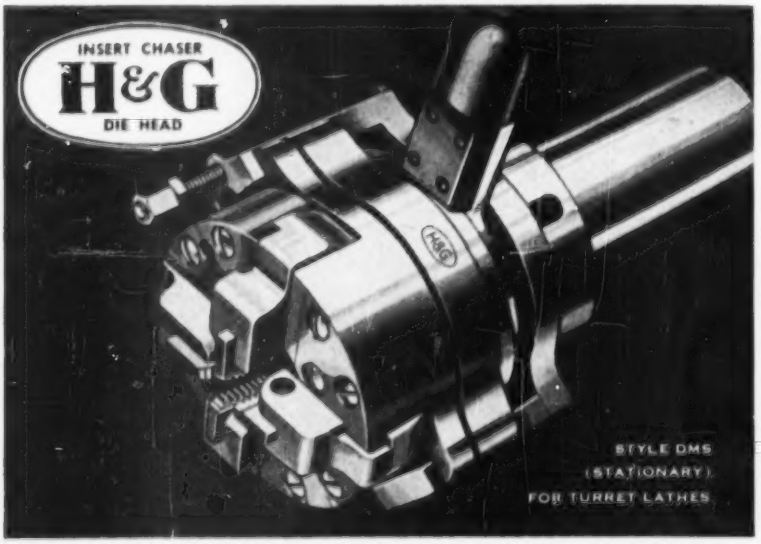
Automatic DRILLING UNIT

GOVRO-NELSON CO.

Machinists of Precision Parts for 33 Years

1933 Antoinette **Detroit 8, Mich.**

INSERT CHASER H&G DIE HEAD



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

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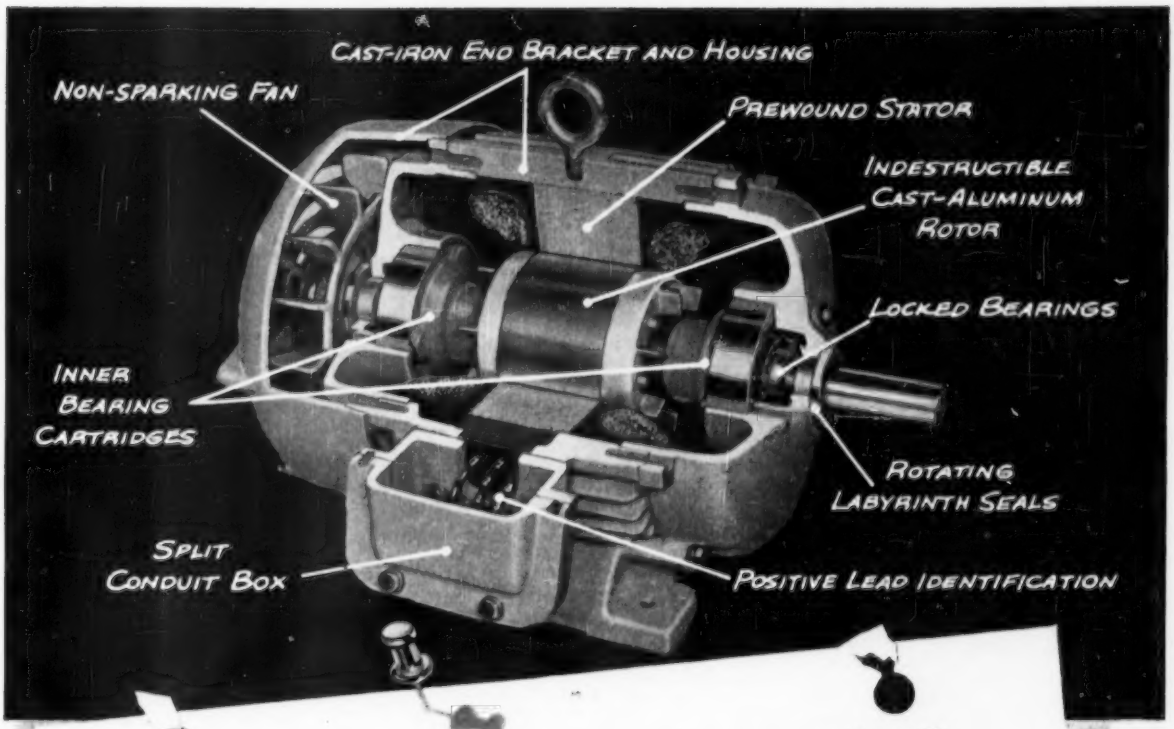

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EP-102

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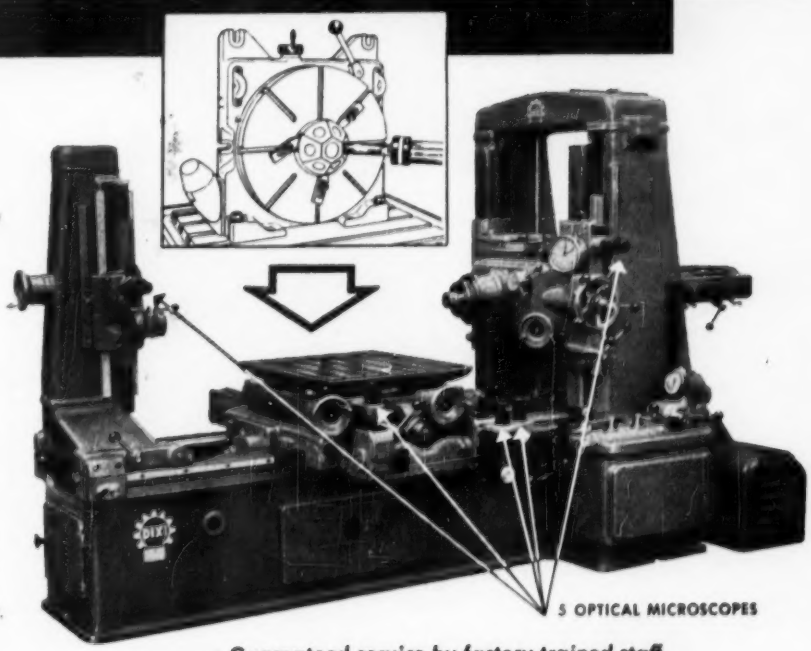

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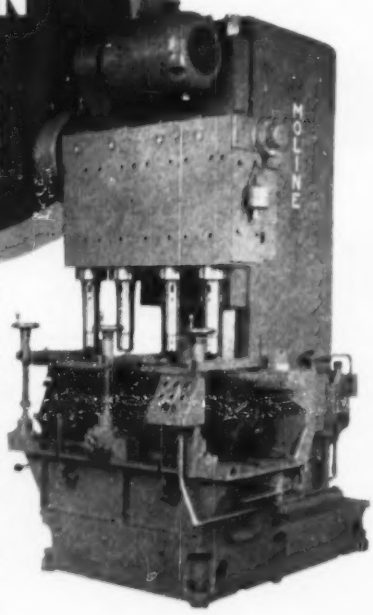

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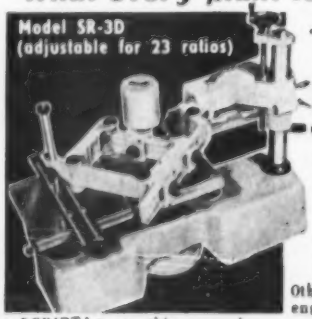

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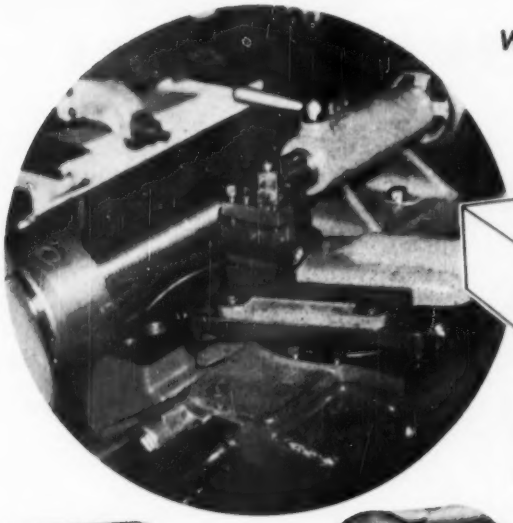

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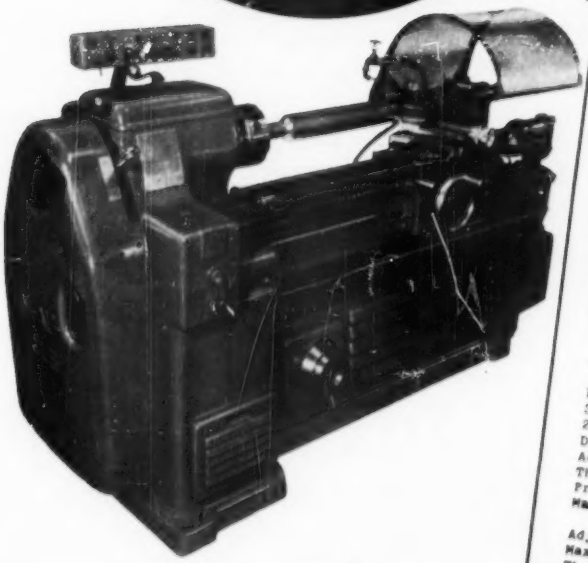

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Dec.6th,1955

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Speed Treat
27" threaded length
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Acme Thread
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Threaded Length 6 3/4"
Diameter 2 1/2"
Type Thread Buttress
Threads per inch 5
Present Milling Time 140 min.
Man-Au-Cycle Time 2 min. 30 sec.

Each piece is being held within .002 on pitch diameter and .0005 for taper.

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Hazel 3 1/2
Threaded Length 4 3/4"
Diameter 1 1/2"
Type Thread V
Threads per inch 6
Present Milling Time 35 min.
Man-Au-Cycle Time 1 min.

Adjusting Screws
Hazel 3 1/2"
Threaded Length 5"
Diameter 1 3/4"
Type Thread Buttress
Threads per inch 6
Present Milling Time 40 min. (est)
Man-Au-Cycle Time 1 1/2 min.

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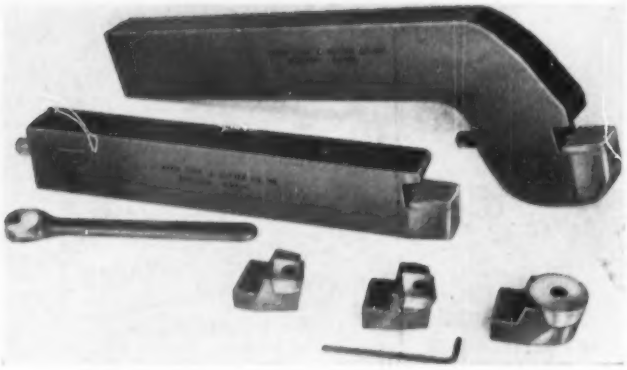

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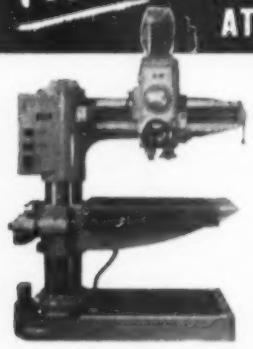

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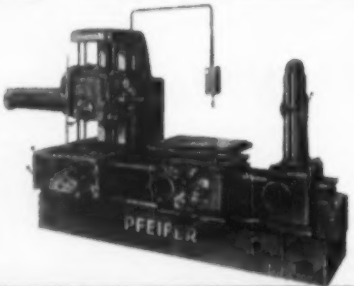

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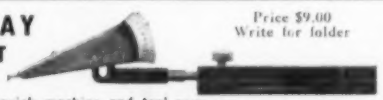

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Gaging . . .

the Surplus Machinery Market

"Rebuilding is carrying us through the summer slump" is what Norman B Botwinik of Botwinik Bros, New Haven, Conn, dealers and machine-tool rebuilders, told us on a recent trip up New England way. A lot more customer plants are inquiring into rebuilding these days because of the long lead times on new machine tools and higher prices.

One of the biggest used-machinery dealers and rebuilders in the East, Botwinik has its main office and plant in Hamden, Conn, a New Haven suburb, plus another, smaller plant at Worcester, Mass, and an office in Paterson, N J.

Used-machine sales are currently a little bit on the down side, Norm Botwinik says, but there are enough inquiries around "to let you know the used machinery business up here is just a sleeping duck, not a dead one." Botwinik figures over-all business isn't down more than 10% or so from last year's record high, and rebuilding is filling the gaps.

Botwinik is a big-time operation. Its huge plant, located along the New York, New Haven & Hartford RR's main line, is famous for its 10,000 (count 'em) windows, has some 80,000 sq ft of floor space given over to rebuilding and storage of machine tools.

The Botwinik brothers, who claim to be the only machine-tool rebuilders to win the Navy "E" with four stars in World War II, are also proud of their ultra-thorough, seven-point rebuilding process. The seven steps: (1) dismantling and cleaning, (2) parts checking, (3) scraping and fitting, (4) modernizing to present-day standards, (5) overhaul of electrical equipment, (6) installation of new parts, and (7) reassembly, realignment, and testing under actual working conditions to achieve close tolerances.

The company has had plenty of chances in recent months to put its rebuilding processes into action. On top of increased customer interest in rebuilding, Botwinik took on a king-sized share of rebuilding machine tools damaged in GM's multi-million-dollar Livonia and Ternstedt Division fires—had scarcely gotten those jobs out of the way when the disastrous New England floods struck last year. Rebuilding jobs poured in from all up and down the Naugatuck and Connecticut rivers—a center of New England metalworking and brass production. While most of those jobs are out of the way, normal rebuilding backlogs picked up in the interim. That's why rebulding is booming there.

As for used-machinery sales, current best sellers up in New England are lathes, millers, and practically any type of late-model toolroom equipment. Production equipment and automated equipment are moving a bit more slowly.

Good late-model machines are just as tough to find up in New England as they are everywhere else, Norm Botwinik reports. He picks up a lot of machines at auctions on the theory that "that's where the action is, and it gives me a good indication of what the going price levels are on a particular type of machine tool—and on tool prices generally for that matter," . . . and that's a switch on most dealers' attitudes toward auctions these days.

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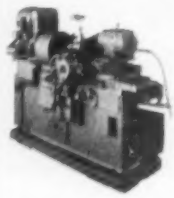

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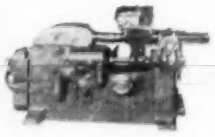

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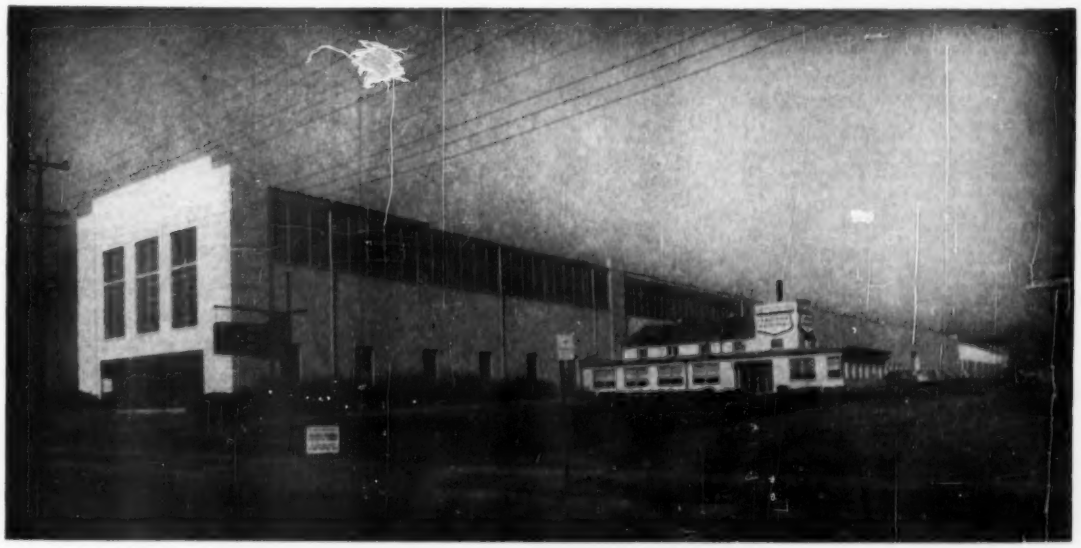

PRESSES

100 ton Wood Hydraulic Press, four col., single action
100 ton Chambersburg Hydraulic
No. 62 E. W. Bliss Duplex Press, m.d.
No. 6 Verdin, Kappes & Verdin Straight Side Press
No. 4 Stevenson O.B.I. Punch Press, direct geared flywheel drive
Type 8750 Hennifin Hydraulic Straightening Press
Model H Cleveland O.B.I. Punch Press, belt drive
No. 1 Losbough Jordon O.B.I. Punch Press, flywheel drive
No. 1 Robinson O.B.I., belt drive
No. 68B Niagara Straight Sided Single Geared Double Crank Press
No. 164½ Toledo Toggle Drawing & Deep Stamping Press

SAWS

No. 4XB Robertson Economy, m.d., new
No. 4B Robertson Economy, m.d., new
6x6" Peerless Hack Saw
No. 3 Motch & Merryweather, 1944
No. 32B Cockran Bly Saw, m.d., latest
11x11" Peerless Hydra-Cut Power Hack Saw, m.d.
Model 401 Cutomatic Abrasive Cut-Off Machine, m.d.

ENGINE LATHES

Gems "Copytor" Duplicating Attachment, m.d.
12"x6' Lodge & Shipley, m.d.
12"x40" centers 6' bed American, m.d.
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
13"x48" centers Pratt & Whitney Geared Head, m.d.
13"x42" centers LeBlond "Regal", m.d.
14"x32" centers Cincinnati Geared Head, m.d., late
14"x30" Lodge & Shipley, m.d.
14"x37½" centers American, m.d.
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x5' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
15"x42" centers LeBlond "Regal", m.d.
16"x30" centers Monarch, m.d., taper
16"x54" centers Sidney, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, m.d., taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x8' Bed Monarch Geared Head, m.d.
17"x6' LeBlond Geared Head, m.d.
18"x48" centers Lodge & Shipley Geared Head, m.d.
18"x6' American, 8 speed, m.d.
18"x6'6" Greaves-Klusman Geared Head, m.d.
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x84" Sidney, m.d.
18"x102" American, m.d.
18"x10'6" bed Boye & Emmes, cone, motorized
19"x8' bed LeBlond Geared Head, Timken, m.d.
19"x10' bed LeBlond Geared Head, m.d.
20"x72" centers 10' bed Cincinnati Loose Change, cone
20"x72" centers Monarch Geared Head, m.d.
20"x70" centers American, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
21"x8' bed LeBlond Geared Head, m.d., taper
23"x84" centers LeBlond Heavy Duty Geared Head, m.d.
24"x12' bed American, m.d.
24"x12' bed LeBlond Geared Head, m.d., taper
24"x12' bed Boye & Emmes, belt drive
24" raised to swing 32"x22' bed—16' centers—New Haven, cone, taper
24" raised to swing 36"x10' centers Sidney, m.d.
24", 51¼" Lodge & Shipley Lathe, m.d.
25"x10' bed LeBlond Geared Head, m.d., taper
25"x10' centers LeBlond Heavy Duty G.H., m.d.
30"x12'6" bed Niles-Bement-Pond variable speed m.d., taper
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20" bed Geared Head, m.d., 11'8" centers

MANUFACTURING LATHES

12x33", 20"x25", Jones & Lamson Fay Automatic Lathes, 1944
12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
No. 4 LeBlond Boring Lathe, 37' bed, 4" hole, m.d., latest
No. 9, 12 LeBlond Multi-Cut, m.d.
4x60" LeSwing, m.d.
8x132" LeSwing, m.d., latest
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
No. 12 Gisholt Semi-Special Automatic Production, m.d.
No. 9WSL, Reid Production Lathe
17"x39½" LeBlond Mfg. Type Production Lathe
17"x75½" LeBlond, m.d.
No. 12 Sundstrand Auto Prod., m.d.

HAND MILLING MACHINES

Van Norman, m.d., latest

UNIVERSAL MILLING MACHINES

No. 3 Cincinnati, m.d., in base
No. 4A Brown & Sharpe Heavy Duty, m.d.
No. 4 Cincinnati High Power, m.d.
No. 2H Milwaukee, m.d.
No. 2MH Cincinnati, m.d., late

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BORING MILLS—Horizontal
JIG BORERS

DEFIANCE Model 25-A Boring Mill 3⅝" bar
DETRICK & HARVEY 4 bar; Floor type
HEALD No. 46B single end, Precision, single spdl.; dia. hole bored about 9" max., ½" min.; M.D.; late type
HEALD No. 22I single end precision; double spdl.; M.D.; late type

BORING MILLS—Vertical

BULLARD 8", 6-spindle Type "D" Mult-au-Matic
BULLARD 16" 6-spindle type D Mult-au-Matic
BULLARD 24", Vertical Turret spiral drive
BULLARD 36" Vertical Turret spiral drive; late
BULLARD 36" high speed 18" extra high column; spiral drive; late type
BULLARD 30"x20" Man-au-Trol Tables; late
NILES 72" Vertical Boring Mill

BROACHES

CINCINNATI I-30 Duplex Vertical, cap. 2,000 lbs. 30" stroke, Hydraulic; late
COLONIAL VBI-10-48 Vertical, cap. 20,000 lbs.; 48" stroke, Hydraulic; late
LaPOINTE 10-54" Vertical, Model SRV, cap. 20,000 lbs.; 54" stroke; new 1947
LaPOINTE 15-66" Vertical; model SRV; cap. 30,000 lbs.; 66" stroke; New 1947
OILGEAR 3XA Horizontal, cap. 20,000 lbs.; 56" stroke; Hydraulic; M.D.
OILGEAR XL-6 Horizontal; cap. 3-tons; 36" stroke; late type

DRILLS—Manufacturing

ALLEN No. 3, 4-spindle, No. 4 M.T.; late
AVEY No. 2, 2-spindle Drill Press; late type
BARNES H-2 Hydram; 2" cap.; 22 swing; No. 5 M.T.; Hydraulic; M.D.; late type
BARNES model H-3; 3" cap., 24" swing, No. 5 M.T. Hydram; late type
BARNES No. 281½, 4-spindle; No. 4 M.T., 20" swing; M.D., late type
BARNES No. 262, Heavy Camel Back; late
LELAND-GIFF No. 2LMS 20" sgl. spdle.; late
LELAND-GIFFORD No. 1LMS, 4-spindle; M.D.; late type
LELAND-GIFFORD No. 1LMS 2 spindle; H.S.; M.D.; late type
LELAND-GIFFORD model 2LMS, 2-spindle

DRILLS—Radial

AMERICAN 7' arm triple purpose; M.D.
CARLTON 6' arm 19" column; late type
CINCINNATI BICKFORD 6' arm 15" col. Univ.
CINCINNATI BICKFORD 4'11" Plain; all groove
MORRIS 5' arm 11" column; late type

GRINDERS—Internal

BRYANT No. 5 Int.; hydraulic; late
BRYANT No. 10-C-16 Int.; hydr.; late
BRYANT No. 10-CP-16 Int.; late type
BRYANT No. 10-38 Internal; hydraulic gap bed; late type
BRYANT model 24-L-26; latest type
BRYANT model 112V Hydr. Feed Grdr. late type
CHURCHILL No. 3 Internal; 8" stroke
HEALD No. 72A3 Plain Internal; late
HEALD No. 72A3 "Gagematic" Int.
HEALD No. 78 Centerless; motor drive
HEALD No. 81 pl. ck. type; late type
HEALD No. 61 "Sizematic"; late type

GRINDERS—Surface

ABRASIVE 1½ hand surface grinder; late
ABA 8"x24" Precision Hydraulic Grinder; late type
BILLITER & KLUNZ 48"x186" Way Grinder
BLANCHARD No. 11 Surface Grinder; late type
BROWN & SHARPE No. 2 motor drive late
HEALD No. 22 Rotary; 12" chuck; M.D.
HEALD No. 24A Rotary; 30" chuck; late
HEALD No. 26I Rotary Surface Grdr.; 12" chuck, latest type
NORTON 6"x18" Vertical; late type
PRATT & WHITNEY "B" 14x36" Vertical, latest
REID No. 48 hand feed; 4"x18" late type

SCREW MACHINES—AUTOMATIC

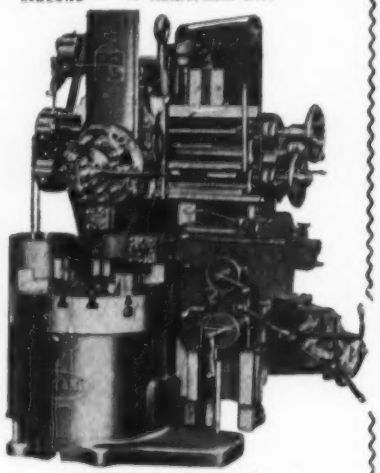
ACME-GRIDLEY 2" RB 6-spindle Automatic Screw Machine; New 1953
BROWN & SHARPE model 00G; late
CLEVELAND 1-1/16" model A single spindle; late
CONOMATIC 1⅝", 8-spindle; late type
CONOMATIC 4⅝", 4-spindle; late type
GREENLEE 1⅝" 6-spindle; late type
GYROMATIC Model 40, 1" 6-spindle; late
NEW BRITAIN No. 65G Automatic Chucking Machine; late type

SHAPERS and SLOTTERS

CINCINNATI 24" Horizontal P.R.T.; late type
GOULD & EBERHARDT 32" motor drive
HENDEY 12" Universal "High Speed"; late
MOREY 8" Vertical Shaper; late type
NEWTON 15" Vertical Slotter; M.D.
PRATT & WHITNEY 6" Vertical; Model B
PRATT & WHITNEY 10" Vertical; M.D.

LATHES—Engine and Mfg.

AMERICAN 36"x204" centers "Super-Productive"; Timken; M.D.; late
GISHOLT No. 12 Hydraulic Automatic; late
HENDEY 16-24"x30" centers; Timken; late
HENDEY 24" x36" centers, M.D.; late type
JONES & LAMSON "Fay" 20"x25" Automatic
LeBLOND 18"x36" centers Auto.; Timken
LeBLOND Model 7ACL Crankshaft; 9"x30"
LeBLOND 20"x48" centers, H.D. Timken; late
LeBLOND 25"x54" Mfg. latest
LeBLOND "9"-"44" centers; motor drive



BULLARD 36" Vertical Turret Lathe; spiral drive; late type

LODGE & SHIPLEY No. 5, 24" & 96" centers; DUOMATIC; Timken; late
LODGE & SHIPLEY 12"x30" G.H. Trm.
LODGE & SHIPLEY 14"x30" Ctr., late
LODGE & SHIPLEY 18-22"x54" Toolroom; Timken; late
LODGE & SHIPLEY 18"x54" Timken
LODGE & SHIPLEY 20"x60" Gap; Timken; late type
LODGE & SHIPLEY 22"x60"; Timken
LODGE & SHIPLEY 22"x72"; Timken
LODGE & SHIPLEY 24"x54"; Timken
LeBLOND 4"x60" centers, late type
LeBLOND 4"x84" centers, late type
LeBLOND 8"x108" centers, late type
MONARCH 14"x54" centers; Model AA
MONARCH 18"x48" "CBB" (raises to 26½"); Timken; late
MONARCH 12"x72" "CBB" (raises to 26½") "KELLER"; late
MONARCH 22"x204" c.c. Model M; late
MONARCH 22"x336" c.c. Model M; late
MONARCH 25"x48" model "N" air tracer; late
MONARCH 36"x84" Taper Attachment; late
NEW HAVEN 42"x120" centers geared
NILES 30"x25" bed, Single End Boring, "Time Saver"; late type
NILES 30"x20" bed, Single End Boring, "Time Saver"; late type
NILES 42"x216" centers Geared Head; late type
PORTER-McLEOD 16"x6' Lathe; New
PRATT & WHITNEY 16"x40" c.c.; Timken
SOUTH BEND 14"x10' bed; late
SPRINGFIELD 14"x43" geared; M.D.; late

PLANERS

GRAY 48"x48"x10' "Maximum Service"; 4 heads; Power Rapid Traverse; D.C. Reversing; M.D.
LIBERTY 144"x70"x48" adj. openside; box table; 4 hds.; vari-voltage; Power Rapid Traverse; M.D.; late type; NEW 1940
NILES 48"x48"x10' double, 4 hds., PRT; M.D.
NILES BEMENT POND 72"x72"x30"; 4 hds.; Power Rapid Traverse; D.C.; M.D.
NILES BEMENT POND 60"x60"x14' double housing; late type
SOUTHWARK No. 1; 16' Plate Edge Planer

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No. 2 Standard Brown & Sharpe vertical mill, new 1943.

No. 2 Cincinnati High-Speed dial type plain horizontal mill, new 1941.

No. 3 Gisholt ram type universal turret lathes (2), new 1942.

No. 5 Gisholt ram type universal turret lathe, new 1940.

Models BL2416-BL3616 P & W Keller machines (3) one late

14" x 42" cc Hendey toolroom engine lathe, new 1940.

No. 5-48 Cincinnati hydormatic duplex mill, late

No. 4 Cincinnati high-power plain horizontal mill, serial E5067.

No. 4 Gallmeyer & Livingstone universal tool & cutter grinder, new 1941.

5' arm 13" col. Fosdick "Economax" hydraulic radial drill, new 1943.

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4" & 3½" Bar Landis, Floor Type (2)
3" Bar Universal Tble. Type, Triway
GRINDERS, 60" Hanchett Vert. Spin., No. 300 Hyd., Surf.
Nos. 2B Reid, 3B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
30"x120" Hanchett Piano, Surf.
16"x96" Cinci. Plain Cyl.
LATHES, 25"x192" Con. Lehmann, T.A.
18"x48" con. Monarch, '42
20"x54" con. Reed Prentice '43
TURRETS No. 2H10 Libby 10¾", '43
Nos. 5 & 3 B. & O. '45
No. 3 Gisholt, Bar Chuck, '42
ROLLS, 10'x¾" Bertsch Pinch '43
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER 36" Rockford Hyd. '44

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- 36" x 240" Centers Niles Timesaver Engine Lathe. New in 1941.

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K & T No. 3B Plain Mill, vert. attach., M1B.

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LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing, Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

27" x 18' MONARCH "N" Geared Head Lathe, 11' Centers, Taper Attachment, Full Equipment. Late Type. 1942.

24" x 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 4', 5', 6' CINCINNATI BICKFORD Radial Drills.

6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

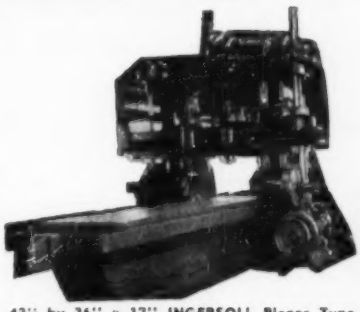
No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

#2B KEARNEY & TRECKER Univ. Horizontal Vertical Head. M. D.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

No. 28-60 CINCINNATI Vertical Hydro-Tel Mill 2 Spindle and Tracer Spindle.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

No. 8 BLISS CONSOLIDATED 90 Ton Cap., O.B.I. Geared. Air Cushion. M.D.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder, Complete Tooling.

4" x 12' LAPOINTE Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 20B BESLEY Motor Driven Disc Grinder, 26" Wheels. Late Type.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

No. 1, 2, BUFFALO FORGE Vertical Angle Feeding Rolls, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

8' x 18 Ga. Wysong & Miles Foot Shear, Late Type.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment, Late Type.

12" ROCKFORD Hydraulic Vertical Shaper, 1953.

18' x 10' x 36' BETTS Double Housing Planer, 4 Swivel Heads, Pendant Control, Box Table, Motor Driven.

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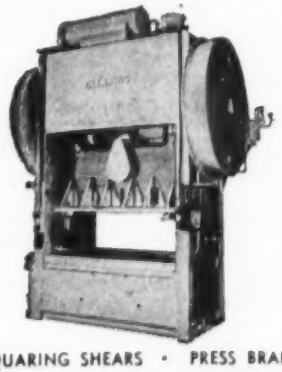

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PARTIAL LISTING

BORING MACHINES

Foote-Burt Vert. 26" sw, new 1941
#49 Heald Borematic, new 1944

DRILLS

1 spdl, 14" sw, #2 Avey, new 1945
1 spdl, 20" sw #2LMS L.-G., 1945
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #4MS8 L.-G., hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LMS L.-G, 1942
3 spdl, 24" sw, #3MS8 L.-G, new 1942
4 spdl, 14" sw, #2LMS L.-G, new 1942
6 spdl, 20" sw, #1LMS L.-G, new 1943
#314-A Baker Univ. H.D., 1943
16 spdl Fay #R60H, #2 taper, 1944

BORING MACHINES

Foote-Burt Vert. 26" sw, new 1941
#49 Heald Borematic, new 1944

GRINDERS

3"x12" #5 B&S, Rap. Trav., 1948
3"x18" #5 B&S, Rap. Trav. 1943
4"x18" No. 4H Landis 1943
6"x18" #10 B&S, Rap. Trav., 1945
6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x36" Norton Type C, new 1942
10"x48" Norton Type C, new 1943
10" (28" sw.) x 48" Cinn. ER, 1943
10"x50" Hill-Clarke, AC Mot. Dr.
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-20"x96" Norton, angular wheel
14"x72" Norton Type C, new 1941
16"x72" Hill-Clarke, AC Mot. Dr.
16"x26"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton, AC MD.
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl.
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-38 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int. Sizematic, 1944
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc, 1946
#3 R Abrasive Surf. 8"x24", 1943
#18-30" Bluemerd Rot. Surf.

LATHES

10ML-16"x36" LeBlond Auto.
#16ML-16 LeBlond, Semi-Auto, 36" cc
12"x30" Hendey Lathe, Taper Att.
12"x28" Lipe Carbo Semi-Auto
13"x33" Fay Automatic
13"x42" Fay Automatic
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
24"x42" Fay Auto. AC MD
36"x126" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1942
120"x96" cc N-B-P, ser. 2380
#5W Cinn Arme Univ. Turret
#1 Gisholt Univ. Tur. A.C.&B.F.
#3H-16 Libby H.D. Tur. 1942
#4A W&S Turret, new 1944
4FU Fastermatic, tur. 32" sw, 1944
#8D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x8" Ingersoll Openside, 1942
54" Ingersoll Vertical Rot.
#M-24 K&T Prof. 1941
#0V Davis & Thompson Vert., 1944
3½" Bar Cinn.-Gilbert Table Type HBM
#12 B Pratt & Whitney Profilers
16"x60" P&W Mod. B Thread Mill
#LT 6"x72" L B Thread
#CT L-B Thread Mill new 1942
No. 2 Cinn. Univ. Hi Power
#36 Van Norman, Rebuilt, 1941
#1-16 Van Norman Prod. 1942
1818-8 K&T Simplex

PLANERS

26"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x30' Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw 8 spdls. 1941
#306 Barnes Vert. Hone, new 1942
15 Ton Hyd American Press, 1946
#11RD 2 Hd. W&S Tapper, latest
#36HM G&E 3 Spdl. Bevel Gear
#81A Fellows Gr Shaper 18" ram
#HR8 Harter Colman Shars Mach
15 T Toledo Overhead Crane, 39'4

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10"x18" LANDIS Type C Hydr. Plain, 1943
10"x36" CINCINNATI Model ER Hydr. Plain, Filmatic, automatic in-feed, automatic wheel reciprocator, 1955
12"x30" LANDIS Type LC Hydr. Universal, 1942
16"x30" NORTON Type C Hydr. Plain, 1942
No. 13 BROWN & SHARPE Universal & Tool, 1943
No. 2 NORTON Cutter & Tool, 1942
No. 2 CINCINNATI Cutter & Tool, b.b. table ways, 1943
CINCINNATI "Monoset" Cutter & Tool, 1943
Model TG-615 JONES & LAMSON Thread, 1943
No. 31 EX-CELL-O Thread, 1940
No. 4-4 BARBER-COLMAN Hob Sharpener
No. 73 HEALD Plain Internal Centerless, "Red Head" spindle, 1943

MILLERS

No. 0-8 CINCINNATI Plain Horiz. Rise & Fall, 1943
No. 2 BROWN & SHARPE Double Overarm Universal, 1947
No. 40 INDEX Verticals, 1949
28/60 CINCINNATI 3-spindle Vertical Hydro-Tel, 1940
No. 33-VP-1848 SUNDSTRAND Fluid Screw Vertical Spindle Rigidmil, 1940
Model LT—6"x36" LEES-BRADNER Thread, 1943

TURRET LATHES

No. 2 BARDONS & OLIVER Geared Electric, 1940
No. 4 GISHOLT "Pre-Selector", bar feed, 1943
No. 4-A LIBBY, Timken, hard ways, 1942
1H5 LIBBY Saddle Type, Timken, hard ways, 1942
4H12 LIBBY Saddle Type, Timken, hard ways, 12½" hollow spindle, 1942

MISCELLANEOUS

32" OHIO Heavy V-ram Shaper, 1943
No. 48A HEALD Precision Boring Machine, 1940
No. 3-20 FOOTE BURT Vertical Hydraulic Duplex Surface Broaches, 1950
AUTOMATIC Double Spindle Profiler, 1941
No. 12-M MOREY Single Spindle Profiler, 1941
No. 12-B PRATT & WHITNEY Double Spindle Profiler, 1941

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K&T 1404 Prod. Mill 1943
CINN 1-18 Prod. Mill 1951
SUNDSTRAND #1 Rigidmil 1954
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
WARNER & SWASEY #3 Air chuck & cyl. 1943
GISHOLT #3, Air Chuck & Cyl. 1943
GISHOLT 1L, bar feed, C.S. turret, 1943
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 37, 30" st. 1942
LAPOINTE, Vert. Broach 20T, 90" st. 1941
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CINN. Cyl. Grinder, 16x72 Plunge 1943
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 28" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.S. 1943

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*Induction Heating Unit—75 KW Tocco, 3 Sta '44
*Lathe—20x84 Sidney H.D. 32 speed T.R. Mod '52
*Lapper—Cinc Centerless, Filamatic '51
*Mill—#2 B&S Horiz w/vert head, 3 HP '48
—#2H K&T Vert. Micr Stops, 5 HP '42
*Press—150 Ton #8½ Vernon OBI w/cush. '45
802 HPM Inj. Moulding, New Controls
*Shaper—36" Rockford Openside, Side & Rail Heads '43
*Thread Mill—CT-36 Less Brudner Univ. new condition

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AMERICAN MACHINIST
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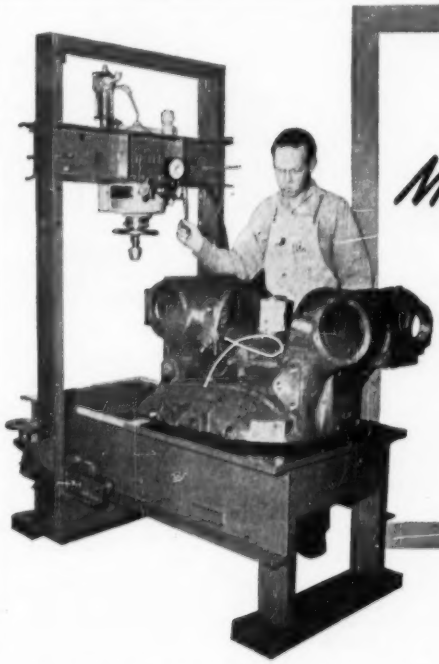

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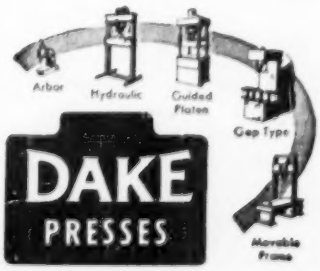

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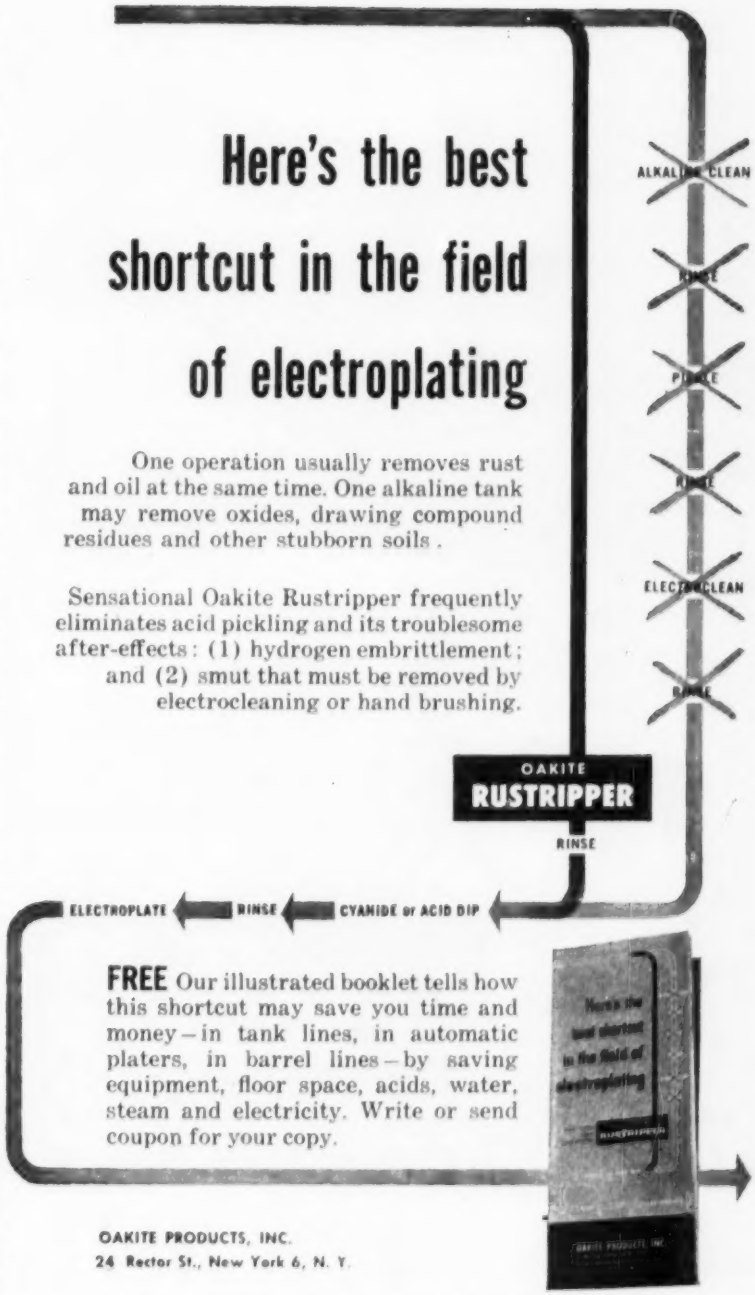

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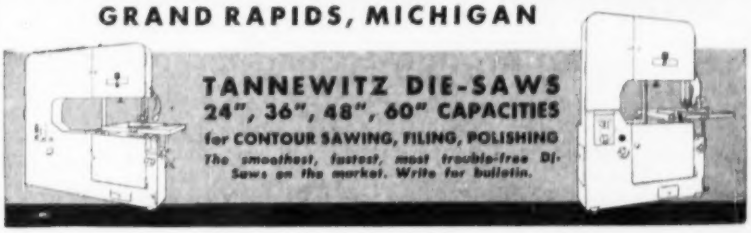
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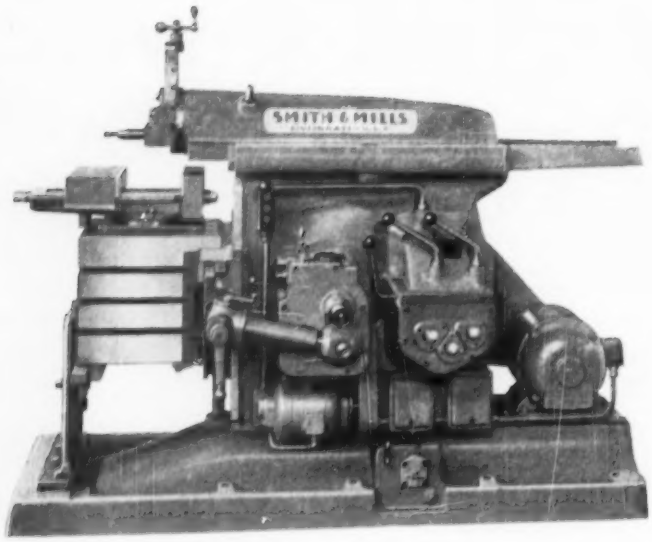

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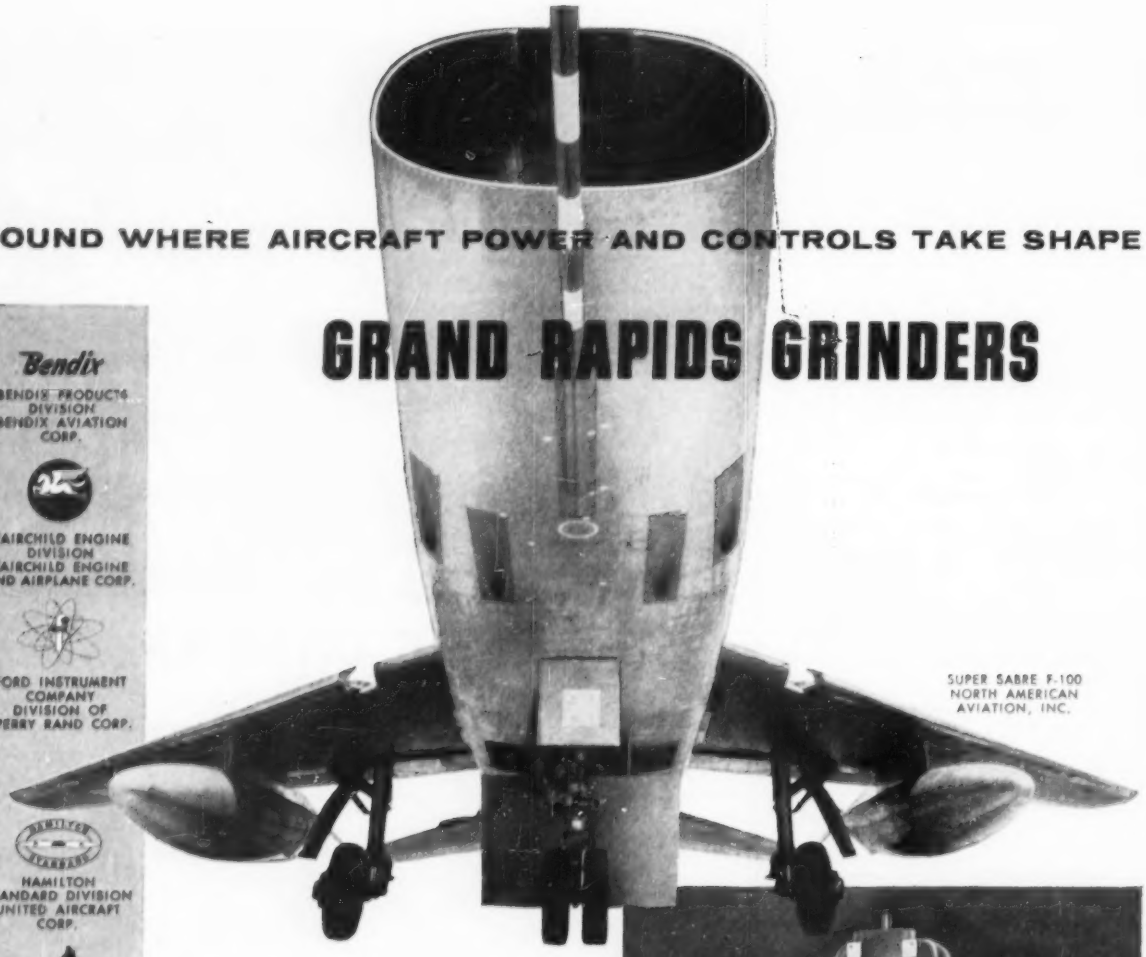

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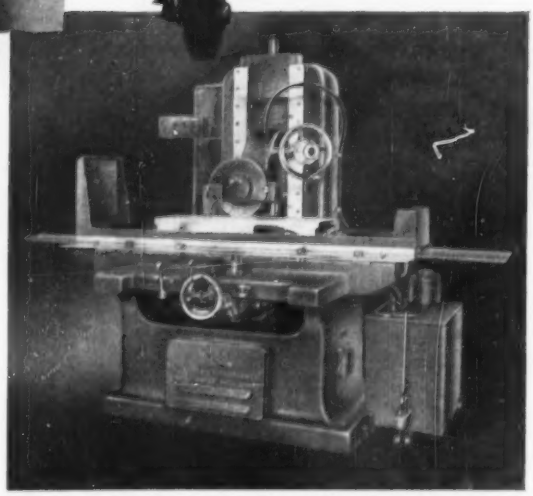

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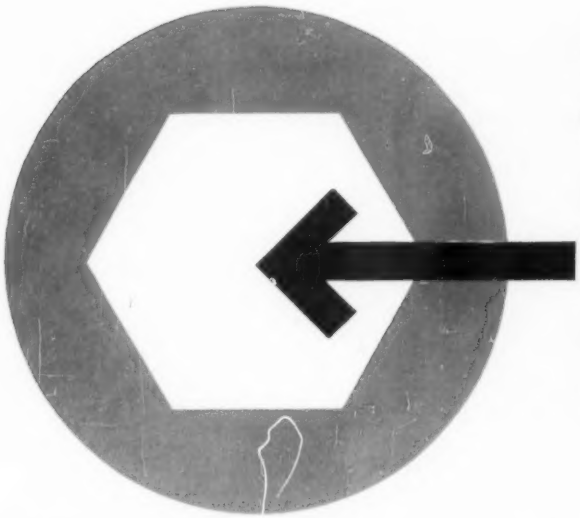

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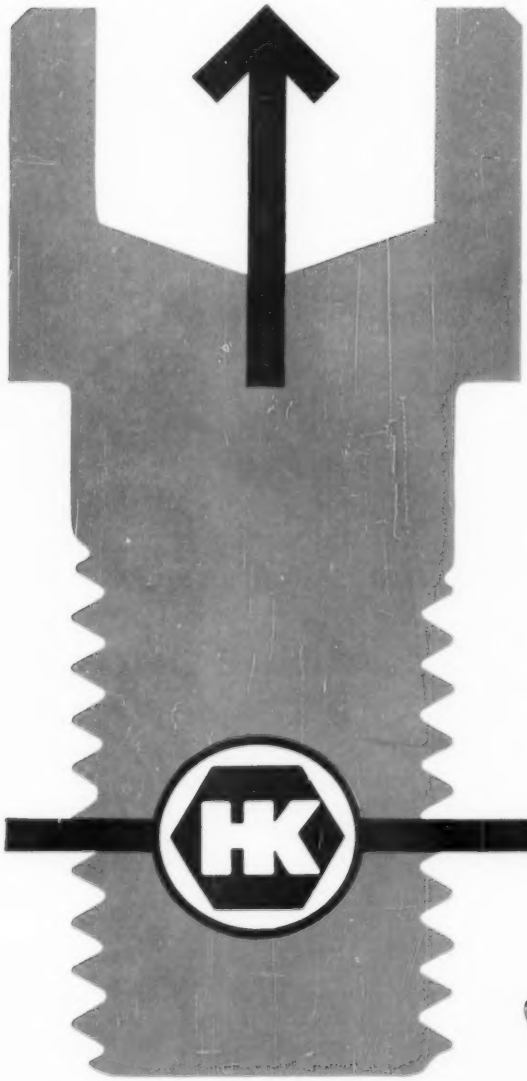

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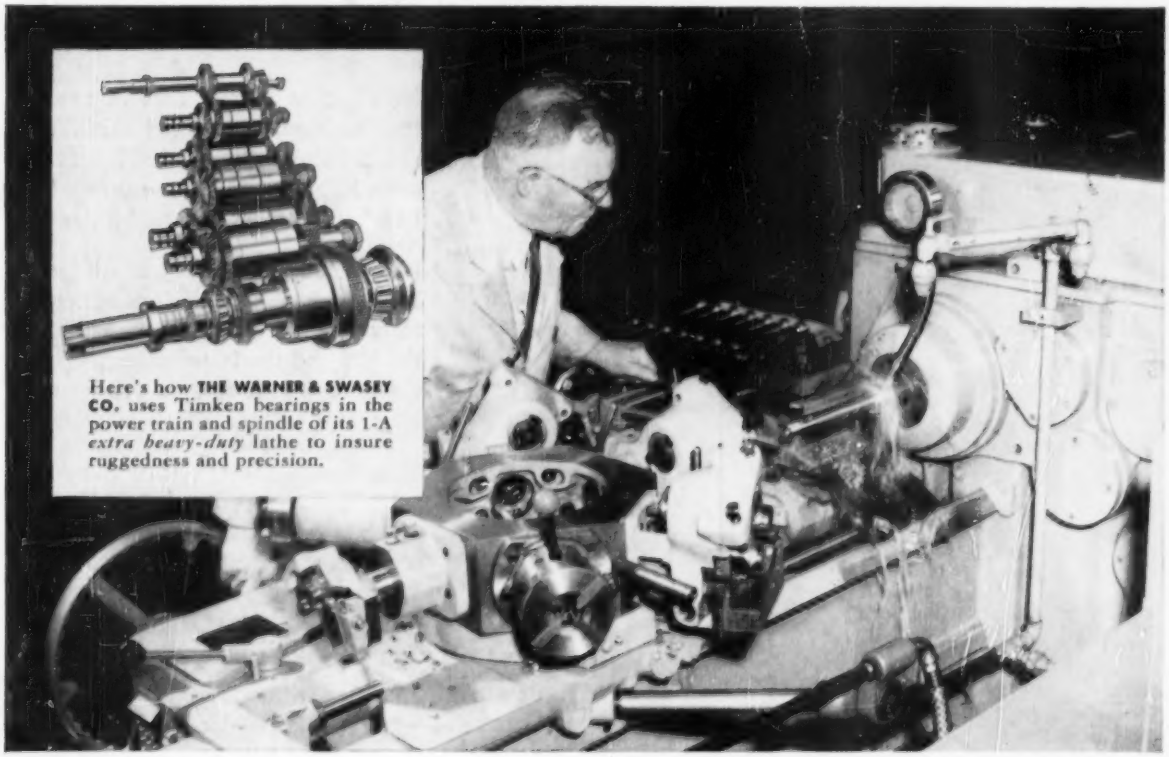

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